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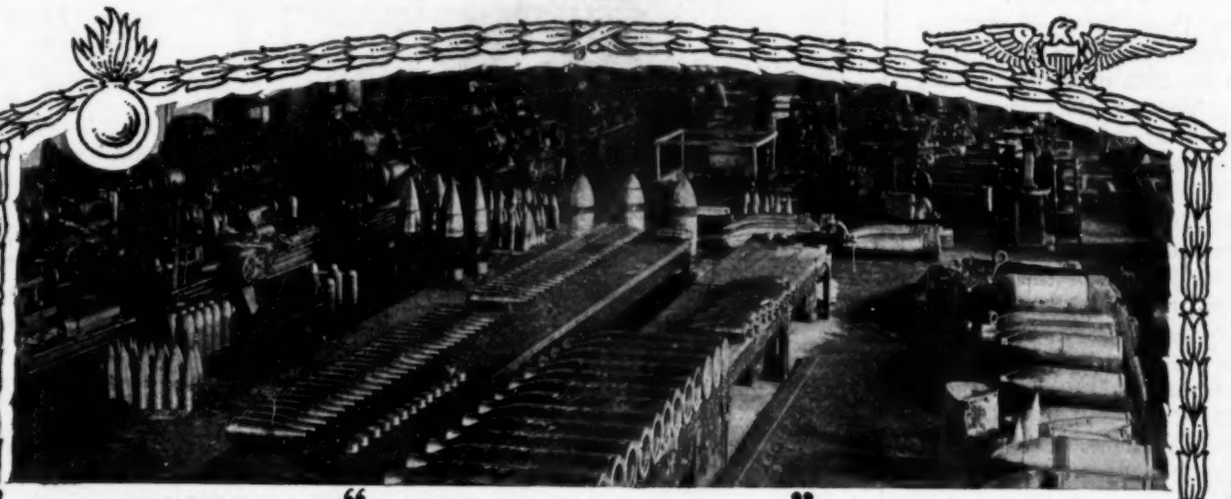


FINDING *the* "CHOKE POINTS" *of* ORDNANCE

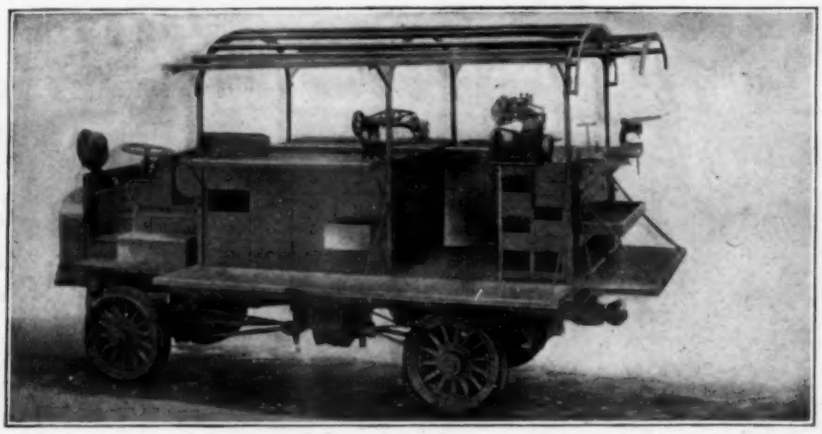
By John H. Van Deventer, Editor in Chief, American Machinist

THE story of ordnance matériel is a story of "components." Cannon, with their carriages, caissons, caisson limbers and accessories, are components of complete battery units. Tubes, breech hoops, spindles, muzzle hoops, locking hoops, jackets and breech blocks are components of cannon. Carriages themselves have many important components, such as recoil mechanisms, elevating mechanisms, traversing mechanisms, trails, axles, spades and wheels. Wheels in turn have as components hubs, tires, rims and spokes. Sights, which are in themselves components of gun carriages, are made up of great numbers of lesser components, including range strips, range quadrants, deviation screws, graduated reticules, azimuth dials, angle-of-sight devices, objectives, oculars and total-reflection prisms. Fire-control apparatus must be considered as components of guns and batteries, for without this apparatus guns and batteries cannot properly do their work. This matériel consists of a mass of components resulting when assembled in such instruments as range finders, periscopic azimuth instruments, battery commander's telescopes, observation circles, deviation boards, aiming circles, sitogoniometers, tachyscopes, fuse setters and panoramic telescopes. A comparatively simple bit of field artillery such as a 37-mm. gun with its accessories has no less than 2500 components.

What is true of guns and carriages and the auxiliary equipment of batteries is also true of the ammunition that must be had before guns can function. There are almost numberless components entering into the various specialized types of projectiles for the 17 calibers of guns that we are using in this war. Shrapnel and high-explosive shell were the two varieties of prewar days; now we have these and also gas shell, smoke shell, illuminating shell, tracer shell, incendiary shell, antiaircraft shell and other specialized types. Each type and caliber requires its individual components, in many cases not interchangeable even for the same caliber. Gas and smoke shell, for example, require a larger booster charge than do high-explosive shell, and all joints must be gas tight. Certain gases employed cannot be kept in contact with iron or steel so these shells must be lined with special material. Illuminating shell must be provided with bases that can be easily blown off by a light bursting charge, thereby discharging the illuminating star or parachute without destroying it. Included among the components of these various shell are the forgings, the machining operation, the propelling charges, bursting charges, fuses, adapters and boosters. Of fuses there are over a dozen specialized types—detonating fuses with super-quick action, used to produce instantaneous detonation of the high-explosive shell for the destruction of barbed wire; detonating fuses with ordinary quick action, which burst the shell before it penetrates the ground and thus scatter its fragments among troops, and detonating fuses with delay actions of various periods,

No unit of artillery or any other ordnance material is complete until all of its component parts are in hand and ready for assembling. Any one of these components has the power to hold up the project and prevent delivery of the goods to the firing line. This article describes the organization and work of the Progress Section of the Requirements Division of Ordnance, one of the important functions of which is to anticipate and report these "choke points" and thus prevent future delays.

which enable the shell to penetrate earthworks or buildings before exploding. There are time fuses of various types, accurate in functioning to the fifth part of a second; combination time and detonating fuses; special fuses for long-range antiaircraft guns, which send a projectile so high in the air that the fuses must embody a watch movement instead of the ordinary powder train, the latter being affected in rate of burning by the variation of atmospheric pressure at these altitudes. All of these items mean an endless variety of lesser components. There are 51 separate components in an ordinary combination time fuse such as used with every shrapnel. Ordnance thus becomes a story of components of lesser and of greater degree, the least one, however, having the power, if lacking, to cause a cessation of activities on the firing line.

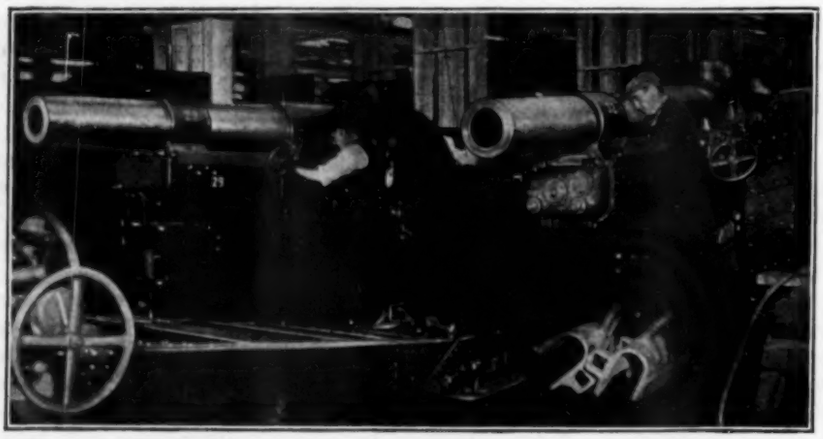


*A light repair shop for emergency work on equipment—This repair truck, while different from the gun-repair truck and other light equipment, is an essential component of an artillery regiment. Its purpose is field repairs for personal equipment, small arms, leather and canvas goods**

Progress in One Plant Depends on Progress In Another

The manufacture of ordnance, to use a comparison borrowed from electrical science, proceeds both in series and in parallel. In the case of a typical series of contracts covering the components and assembly of 75-mm. shrapnel no less than 28 manufacturing plants perform their specialized functions and turn their product over to the loading and assembling plant. Progress in one plant depends on progress in others whose work on the part precedes. Guns, carriages and recoil mechanisms, which function together on the battlefield, are built in separate plants. The optical instruments which enable them to function are made in still other factories. Batteries are not shipped abroad in complete units, accompanied by so many rounds of ammunition ready to fire. No one factory and scarcely any one production district is in a position to take such a broad view of components as a whole as to insure their proper timing to come together in France with enough of this, that and the other necessary component to make the whole available for use. Hence the necessity for a centralized ordnance Progress Section.

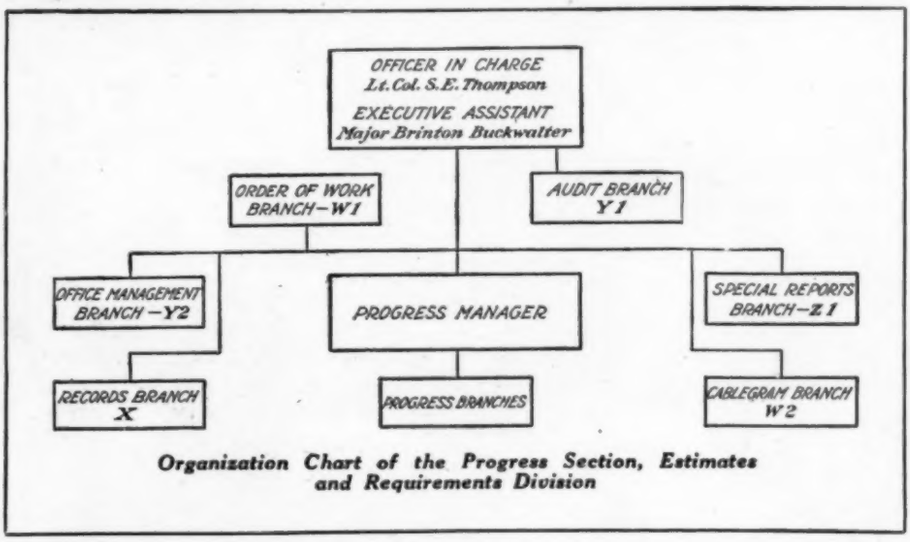
The eight special assistants to the Chief of Ordnance, whose duties were outlined in a preceding article in the *American Machinist*, furnish the individual responsibility and the personal direction of progress of ordnance work through the various functional divisions.



*Wheeled howitzers of 8-in. caliber made in America—None of these guns can be completed until their least important components are ready, and the guns themselves when complete are of no military value without ammunition means to carry it and facilities for emergency repairs**

It is the function of the Progress Section to keep track of the progress of components for all ordnance matériel and to supply the Chief and these special assistants with data on which they can base their actions. The form of organization of the Progress Section is shown in the line engraving. It is headed by Lieut.-Col. Sanford E. Thompson, the well-known industrial engineer of Boston. There are 29 subdivisions, or branches, each of which is in charge of some officer or civilian with sufficiently trained help in the form of assistants, clerks and stenographers to secure the quick functioning necessary to make this work of value. Altogether the personnel consists of 19 officers and 164 ci-

vilians. Each branch head is charged with the responsibility of determining the instantaneous and progressive status of one or more complete items of ordnance matérial. Each Friday he makes a formal report to the Chief of Ordnance. At all other times he must be ready to respond promptly to requests for information as to progress coming from the Secretary of War, the Chief of Staff, the Chief of Ordnance, the Director of Purchases and Supplies, the Chief of the Estimates and Requirements Division, the Adjutant General's office, from overseas or from any other properly accredited agency. Each branch head knows in detail the history of the matériel with which his branch is identified from the declaration of war to the present moment. Knowing its history requires that he should know the history of each of the components of this matériel. No unit of artillery or any other matériel is complete until all of its components are in hand and ready for assembly. Any one or more of them has the power to hold up the project and to prevent delivery of the final product on the firing line. There is always a limiting component. No matter what it is it must be attended to instantly or production, from the firing line point of view, ceases.



Organization Chart of the Progress Section, Estimates and Requirements Division

Specialized Workers Spot the Low Points

It is under these conditions that the various branches of the Progress Section which are not occupied in routine work begin to function. Familiar with everything that goes to make up a complete unit this corps of specialized workers spot the low points, find the reasons and call attention to them. In this way it is possible to coördinate the activities of the many other sections of Ordnance that are responsible for some particular kind of matériel or for performing some particular function with respect to it, such as designing, procuring, producing, inspecting, etc. Men and women elsewhere in Ordnance are engaged in keeping tabs on components, each again according to its kind. The workers of the Progress branches of the Progress Section are in turn keeping tabs on all of the principal components that go to make up complete units such as 37-mm. guns, 75-mm. guns, 240-mm. howitzers, hand grenades, trench mortars, rifles, all classes and calibers of ammunition, etc.

Diverse are the influences which affect the flow of components and result in "choke points." Raw-material supply, fuel, transportation, labor conditions, wages, social conditions, epidemics and the weather each, has its influence in production. All of these things in the mind of a worker in the Progress Section tend to make him a busy man and leave little time for recreation. But this is true of the majority of ordnance workers.

The activities of this branch extend not only throughout the whole of the Ordnance organization, but indirectly to the factories engaged on war contracts. All of the branches of this section are continuously matching up components in order to check what is being produced against what is actually required to form complete units. In turn the Special Reports Branch of this section coördinates the work of the various Progress branches. This branch studies the deliveries of material, taking into account factory capacities and General Pershing's requirements. If there is an oversupply of one component and a shortage of another this is reported by the branch to the office of the Chief of Ordnance, and suggestions made as to shifting manufacture from one factory to another or from one component to another so as to bring production in line with requirements. Requests for special reports on various activities come into this section continually, 148 of them having been made during a recent 10-week's interval. Chief of these was a 325-page report on the productive capacity of the United States, which was made for a prominent Government official prior to his departure for France. This was a day and night job, involving an immense amount of compilation and calculation and necessitated the commandeering of all of the photostat machines in the Ordnance Department for its completion.

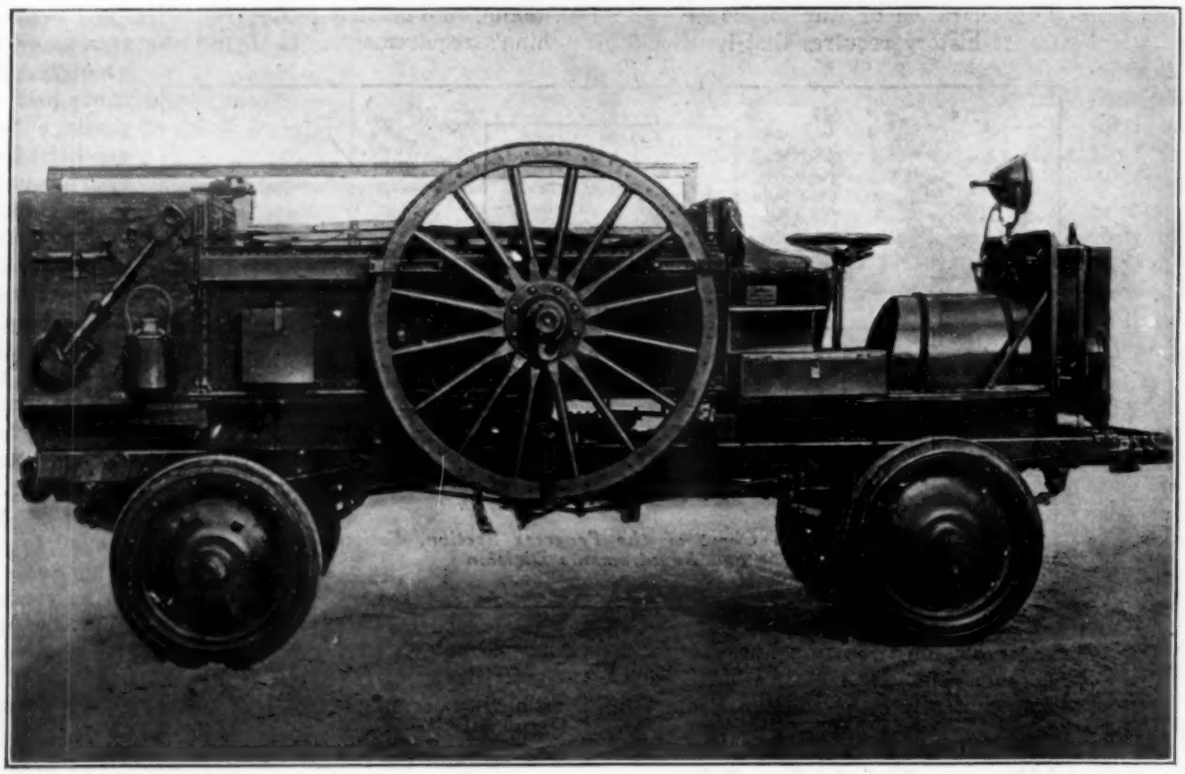
Special Report a Large Job

Another big job was a special report for the American Expeditionary Forces on numerous and varied items of ordnance equipment. This report covered for each item the total amount on order in the United States to Sept. 1, 1918, the total shipments against these orders, the amount known to have been lost in transit and the amount estimated to be available for flotation month by month for the following six months. A job of this kind may be said to cover 19 acres, for it involves collecting data from Ordnance departments occupying this floor space.

A task that drew heavily upon the capacity of the Progress Section was the preparation of 20 "Narratives" on the most common and necessary ordnance matériel. These were written from the production point of view, and gave a complete history of each

item covered as well as its engineering description. For the Director of Chemical Warfare this section prepared in detail a report on all projects, past and present, including material common both to Ordnance and the Chemical Warfare Service. This report covered gas, smoke and incendiary-mortar projectiles, with their adapters, fuses and boosters, gas, smoke and incendiary grenades and their fusing elements, as well as projectors, mortars, emplacement sets and impact sets. Any one of these reports is a formidable piece matériel that happens to be of immediate interest and importance to him.

To keep accurate record of the production of all of these components and to be ready at any time to picture their status, either individually or in coördination with all of the other components required to make up a complete unit, demand a high degree of intelligence, ability and energy. The mention of a few of those in this section who have established reputations in the industrial field will assure the reader that these



A motorized battery-repair truck for American field artillery—Hundreds of individual parts or components are required to build this truck aside from the spare parts that it carries for hurry-up replacements. Every inch of space on a truck of this kind is utilized. Parts that are damaged beyond repair are replaced on the battlefield, and gun, carriage, caisson or limber which have been put out of commission made serviceable

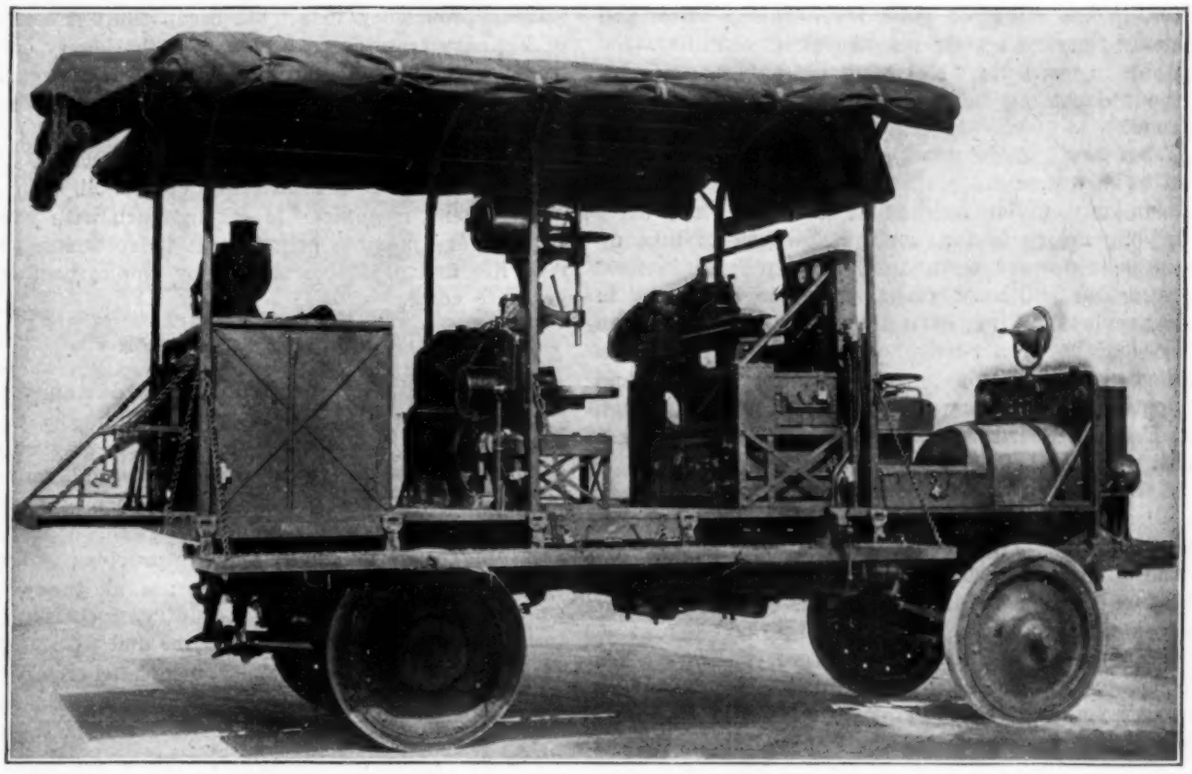
of work, reaching as it does into the activities of every contractor in the United States who has to do with that particular material.

The continual study of what is being produced places the workers of this section in a position to frequently lubricate the wheels when they become gummed through inadvertence or oversight. Only recently this section dislodged a big order for pipe cutters for Pershing, anticipating their expected delivery by a full month through the use of judgment and the long-distance telephone.

Analyses of cables from abroad which have to do with production is naturally a function of the Progress Section. Information based on available progress reports or on recommendations from the various operating divisions of Ordnance is continuously being furnished to Pershing on the status of any item of ordnance

qualities are not lacking in the personnel of the section. In addition to the Chief of Section, Lieut.-Col. Sanford E. Thompson, who has been previously mentioned, there are such men as Maj. Brinton Buckwalter, general manager of Breitung & Co., Ltd., and formerly secretary to Mayor George B. McClellan of New York; Dr. Adams S. McAllister, formerly editor of the *Electrical World;* George A. Wardlaw, formerly editor of the "Transactions of the American Institute of Electrical Engineers," *Electrical Record* and *Electrical Engineering;* Olin H. Landreth, professor of engineering at Union College; Maj. Clayton W. Pike, formerly chief of the Electrical Bureau of the City of Philadelphia; Capt. George H. Bayne, formerly chief engineer of the Pennsylvania Coal and Coke Corporation; George A. Taber of Pollack & Taber, consulting engineers, and also professor of water supply and sewage disposal at

the Brooklyn Polytechnic; W. N. Dickinson, president of the Standard Plunger Elevator Co.; W. B. Tyrrell, general manager of the Bradley Knitting Co.; Arthur W. Nye, professor of electrical engineering at the University of Southern California, and many others of equal note. There are also a number of women workers in this section, most of them normal-school or college graduates, representing the best that America has of cultured young women doing their bit.



Gun-repair truck—miniature machine shop on wheels. Few people realize that the portable machine shop such as shown above is a very necessary component of a field battery or artillery regiment. It contains its own power plant and sufficient machine tools to make ordinary repairs on the spot. A device of this kind is not so much a convenience as it is a necessity in keeping guns at the front in proper working order

In the Progress Section there may be obtained at any time by duly authorized officials a presentation of the status of the components and complete units on all Ordnance contracts. What this means may be better understood by stating that from Apr. 6, 1917, to Sept. 30, 1918, the section issued 32,961 separate contracts ranging from one for 75c. for photographs from a studio in Butler, Penn., to one for $135,000,000 for a powder plant at Nashville, Tenn. All told, the Ordnance Department contracts issued between these two dates amount to $9,865,253,529.66. It is the picturing of the progress of the components for which the most of this enormous sum was spent that has called into play the Progress Section of the Estimates and Requirements Division of the Ordnance Department. The work of the other sections of this division in figuring the requirements of an army will be described later.

*Illustrations on pages 968 and 970 marked with an asterisk have been copyrighted by the Committee on Public Information.

Shellac as an Adhesive

By John Parker

While much has been said and written about the use of glue as an adhesive agency in pattern work I have seen little reference to shellac for the same purpose. Under certain conditions, for instance as obtain in tropical climates where heat and humidity prevent the glue from drying, it is impracticable to make a glued joint that will hold, while shellac if properly used will dry quickly and insure a satisfactory job.

To use shellac for this purpose on a rush job a heavy coat should be applied to the surfaces to be joined, the application being made as quickly as possible so that the alcohol will not dry out unevenly, then hold the surfaces over the flame of a lamp to dry out the surplus alcohol, close the joint and clamp the parts together. The piece will be ready to work in five minutes and the joint will not pull apart under any ordinary operation.

On large jobs and pieces for which there is no special urgency apply a heavy coat to each surface, or two lighter coats, allowing the first to dry before applying the second. Clamp the pieces together and allow time enough to dry.

That the alcohol in the shellac will evaporate under conditions that water will not is the reason that it can be used in the tropics where water-mixed glue cannot.

How the Disabled Soldier May Become of Use to Industry

WHAT are your present circumstances, you who have returned from the battlefield wounded more or less seriously, or you who have lost a limb, or you who have been handicapped by disease contracted in the service? You had thought of dying and you find yourself living.

Yet, in the midst of your joy of being alive, you suddenly remember your wounds, your disability, and you say to yourself: "No, I am not as I used to be. Without doubt my future is wrecked. What am I to do now?"

"What am I to do now?"—that is the question we want to answer.

If, in your opinion and in that of those looking after you, your injury is such as to allow you to take up again your former occupation, in your own interest do so. You will most probably be more efficient in your previous calling, even though handicapped, than you would be in a newly acquired one. If you can be helped by training before returning to your old occupation, Uncle Sam will provide it for you through the Federal Board for Vocational Education. That board will also help you to get employment.

If, however, you have been so unfortunate as to have lost a limb, or to have received a grievous wound, or be suffering from some other disability, and are forced in consequence to take up a new vocation, to whom will you address yourself for guidance in the choice and carrying out of such reëducation?

This question which so many before you have asked themselves and which we have helped solve, and which you ask yourself in your turn, perhaps at this very moment, is the question which we propose to help you in solving.

Federal Board

Have you heard of the Federal Board for Vocational Education, which was founded by Uncle Sam almost two years ago to train people for their work in life and to which Uncle Sam has intrusted the task of also training and placing disabled soldiers and sailors in suitable employments? This board has its headquarters at Sixth and E Sts., Washington, D. C., and its offices are open daily from 8:30 a.m. to 6 p.m. The board has branch offices in each of the following cities: Boston, room 433, Tremont Building; New York, room 617, 280 Broadway; Philadelphia, Penn Square Building, 1416 South Penn Sq.; Washington, Baltic Building, 606 F St., NW.; Atlanta, Candler Building; New Orleans, 822 Maison Blanche Annex; Cincinnati, 906-907 Mercantile Library Building; St. Louis, 517-521 Chemical Building; Dallas; Denver; Chicago; Minneapolis; San Francisco and Seattle.

Through this board you can get information or service either from the central office or from any one of these branch offices. Should you apply in person or should you write a letter it will be given prompt attention.

Through this board and its branch offices Uncle Sam guarantees to every man disabled in the war under circumstances entitling him to benefits of the War Risk Insurance Act, the benefits of such of the following services as he may require: Vocational advice and assistance in selecting a suitable occupation; help in returning to the old occupation again if advisable; support while in training for a new occupation or for greater proficiency in an old occupation; a course of preliminary training; a period of probationary employment; permanent employment in a desirable position, and follow-up work to protect him from mistakes and exploitation.

For this program Uncle Sam has provided liberal funds. The Federal Board for Vocational Education, as his agent, is anxious to get in touch with you and be of every possible help to you in restoring you to civil life and profitable and happy employment in the years to come.

Variety of Instruction

As you will see, the Federal Board stands ready to give you training, if you need it, for any occupation for which you, with your disability, may be fitted along professional, agricultural, commercial, industrial or trade lines. So anxious is the Government to give each disabled man the widest possible opportunity, according to his handicap and his previous experience and ability, that it is ready to use all the existing educational facilities of the country, including those to be found in schools, offices, farms and workshops.

Rest assured, you disabled who read these lines, that on the one hand what the Federal Board has done for other disabled soldiers and sailors it desires to do for you, and that on the other hand it is to your interest to have recourse to these services.

The board will have vocational advisers in the reconstruction hospitals of the War and Navy departments. These advisers will be anxious to talk to you as soon as it is apparent that you are to be discharged from the service because of your disability. Tell them about yourself as freely as you would talk to your best friend. If you are already out of the hospital when you read this go to the central office of the board in Washington or to the district office in one of the cities as above given, and talk with those in charge. Speak to them regarding your present condition and seek their advice regarding your future. They will give you a cordial reception and will do everything possible to assist you.

If you are out of the hospital and it is not possible for you to go as far as the central office or district office, write, stating what you are thinking about as to your future and what you are interested in. Inquire what can be done for you. You will always receive an answer which will be guided by the friendliest consideration of where your greatest good may lie in order to help you into that path.

One's duty is never done too well. For this reason the Federal Board seeks you at your bedside in the hospital. The board has the firm desire to do every-

thing in its power to relieve the present of all worry and misgiving concerning your future.

If you are interested in the foregoing, read the following questions and answers:

Why do I want to "go over the top" into civil life? Because I am either a soldier or sailor of the best country in the world. While fighting for my country and all she stands for I received the disability that makes it necessary to discharge me from the service and make me a civilian again. But "there is a whole lot of man left in me yet," and I am deeply interested to learn how I can make the most of myself as a returned soldier.

What do you mean by "going over the top" into civil life? It means that before he goes back to life as a civilian a fellow can get advice and training and placement in good employment from Uncle Sam. Armed with this and his own pluck as well he can get and hold as good or better job than he had before he went to war.

As a disabled man of my great country returning to civil life with a proud record, what do I owe myself as a man and as a citizen? You enlisted for the duration of the war, an indefinite period. It was to be until you, together with the rest of us, had made the future of the Government safe. If you were "back there" you would not think of going home, except on a furlough, until the final victory. Now that you are about to get your discharge from the Army you think the war is over for you, but Uncle Sam, through the Federal Board, has another idea about that indefinite period, "the duration of the war." So far as you are concerned, he doesn't want you to go home, except on a furlough, until the Government has made your future safe for you.

As a disabled man discharged from the service, what help may I get from my country in making the most of myself? Uncle Sam proposes to help you reëstablish yourself in civil employment as an independent worker, with every opportunity for advancement. The Government has provided hundreds of courses, among which there is one precisely suited to meet your needs, one in which you may become efficient, whatever injury you may have suffered.

Results of Training

Do many fellows "go over the top" into civil life in good shape? Do you know that most of the men who have taken vocational training in France got better jobs than before they went into service? Some of them got into jobs they never dreamed of before just because of this overhauling, which they'd never had because circumstances had compelled them to take the job that offered. Hear this from the Director of Vocational Training, Canada: "We have a number of men who were merely common laborers before the war and have through retraining been enabled to take positions of responsibility requiring not only skill but, what is more important, judgment. For instance, we have a man who was a teamster. We trained him as a machinist at McGill University and he went to the Dominion Bridge Co. after graduation and was within six months a foreman. We have other men who were mechanics in some low-grade occupation and are now in responsible positions as secretaries, etc., with salaries up to $200 a month." In England there is a one-armed telephone engineer who was a butcher before the war; a hand bootmaker with no legs who used to be a laborer; a blind waiter who became a masseur; an armless carpenter who is now a building inspector, and an armless bricklayer who is manufacturing airplanes; a clerk who lost his left arm and his right hand has now become a draftsman; an office boy with his toes gone is now a chauffeur, and a laborer with both legs paralyzed learned to run 20 looms unaided.

Occupations Taken Up

Into what kinds of positions do the fellows go whose countries are helping them "go over the top" in such fine style? Many thousands of wounded and otherwise disabled men have been trained and placed in new occupations in France, Italy, Belgium, England and Canada. The list of occupations for which instruction has been given is too extensive to present in full in this brief article, but these occupations include such things as: Professional occupations, such as those of law, medicine, teaching, engineering, and even theology; agricultural occupations, including professional agriculture, forestry, farm management, general farming, dairying, beekeeping, poultry raising, swine herding, truck gardening, horticulture, farm mechanics, and many other lines too numerous to mention here; commercial occupations, including not only shorthand, stenotypy, typewriting, bookkeeping and general accounting, but also civil-service positions, telegraphy, salesmanship, insurance and banking; and trade and industrial occupations, including not only those found in the well-recognized trades like the metal trades, the wood-working trades, the building trades, the electrical trades, the automobile trades, the textile trades, the transportation trades, the chemical trades, the shoe-working trades, the clothing trades and others, but also many highly specialized occupations of modern industrial life, such as autogenous or electric welding, wireless operating, shipbuilding, motion-picture operating, etc. If you are interested in getting an extensive catalog of occupations for which disabled men have been trained and placed you can secure it by getting in touch with the Federal Board for Vocational Education. The board is prepared to train for a great many more occupations than have been offered in other countries. In the case of each man the whole matter should start with his own interest and preference and previous experience and ability as well as his existing handicap. This means a conference between the man and the representatives of the board.

Why is my country so anxious to help me "go over the top" into civil life? It wants to conserve you as a part of its precious man power. Every man restored to profitable occupation is an asset, and hence a relief to the nation. Every man who fails to contribute to production is a liability, and hence a burden to the nation. Now that the war is over, the country is going to have a big burden trying to get back into its ordinary channels all the money and machinery it had to divert from them to carry on the war. Do not add to it by being just one more man diverted from industry who does not get back again. Take your place and carry on. The country does not owe you a living now any more than before. But it owes you a better oppor-

tunity to make one if you have been handicapped for the battle of life by fighting her battle at the front. This it offers you in a better way than ever before devised.

Do you think that a man with my previous experience and disability can "go over the top" successfully? Investigations of the Federal Board have shown that no profession or trade or occupation is too difficult for a disabled man provided he has the ability to fill it and the grit to prepare himself to conquer it. You too can conquer it and get the ability to fill that position which is waiting for you. Offset your disability by acquiring greater technical skill than you had before you entered the service, or by acquiring a new occupation to take its place. Make yourself worth more above the neck than you ever were before, and it won't make very much difference even if you are worth less below the neck. Quit thinking minus and begin to think plus. The Federal Board for Vocational Education has a proposition to make to you: Use that handicap you got in the service for your own service. Make it the means of your being even more effective than you were before you entered the service. Lots of men have done it, and you can do it. The board will show you how.

Selecting an Occupation

How will Uncle Sam help me, through the Federal Board for Vocational Education, to determine what I should do to "go over the top" most successfully? If you elect to take this opportunity to retrain, which the Government offers you, you will be advised in regard to your future occupation. Your wishes and temperament and ability will be consulted. The board intends to encourage initiative and individuality in every way. No words need be wasted on that part of it, but some few may be necessary to point out that the opinion of the vocational adviser, representing the Federal Board, as to the kind of future occupation which lies within your abilities is at least as reliable as yours and by working together the two of you should arrive at a wise decision. It often happens that it is wiser to train a man for a new vocation than to try to fit him to keep his old one. In that case it may happen that you will not want to do what the vocational adviser thinks is best. Well, give him a chance to show you. If he proves mistaken and you prove in the right you can take up the occupation that you proposed. It is your interests which he has at heart and he is here to look out for them. But he has many factors to help him make up his mind about your job which you do not at present possess. His job is to see that you go into a growing rather than a waning trade. Also, there may be some occupation for which you are suited in which the training would be shorter and easier, but in which regular employment is doubtful. Remember that he knows the entire field and you know only a part of it. His duty is to see that you go into permanent employment. Again, there may be occupations which seem particularly desirable to you but which are subject to local and seasonal fluctuations. He will steer you away from them and into a position where you need not be out of work a portion of the year because the shop you fitted yourself for has temporarily shut down. Lastly, there are some occupations which, because training for them is short and easy, will tend to become overcrowded and to pay less wages. Remember that the vocational adviser will look out for your interests and he merits your entire confidence. The Government has been fitting him to give you advice with all the resources in its power, and he has at heart your interests and those of no one else.

If I can follow my old occupation successfully and want to go back to it, what help will Uncle Sam give me through the board? The board will help you to find suitable employment at a just wage with an employer who is interested in you not only as an ex-soldier but as a workman whom he proposes to give every chance to do his work successfully and to prepare for advancement and better wage.

If I can go back to the old position or another one in the same establishment and my employer promised to take me back into his employ when I returned, how will the Federal Board help me? As your official friend the representative of the board will be glad to write your old employer, calling his attention to your case, recalling his promise, describing your disability, stating your desire to return to his service, and asking him to reëmploy you in accordance with the understanding you had when you left for the front.

If I could follow my old occupation but want the help of more training before going back to it, will Uncle Sam give me this needed instruction? Yes, the Federal Board will provide the instruction for you. It believes that it is the duty of the Government to help you to realize your full capabilities, and training may be necessary—and usually is necessary—to accomplish this end with a disabled man. The board also believes that, as a disabled man, you are entitled to all the training necessary to fit you to compete successfully with a normal workman under normal conditions. This means training of the head as well as the hands in order that with your handicap you may meet competition successfully, get a steady job and win promotion.

Uncle Sam Pays

If I need training for a new occupation, will Uncle Sam give it to me? Yes, and Uncle Sam will pay for it. By an act of Congress the Federal Board is required to provide a course or courses of instruction for a new occupation elected by a disabled man who is not able to follow his old occupation successfully and must be trained for a new one.

If I ever had an occupation or if I was a student when I enlisted, will Uncle Sam provide vocational training for me? Yes, just as in the case of any other disabled man needing training for some self-supporting occupation or profession.

There are many unskilled occupations into which I could go and where as an ex-soldier or sailor I should be gladly received. Why not take one of these and not bother about training? The worst mistake a disabled man can make is to drift into a low-grade, unskilled occupation. Without any training he must compete with a normal man in a line of work where brute strength and physical fitness alone count. There can be no doubt as to the outcome when work gets slack. Most disabled men returning from war cannot rely solely upon their compensation under the War Risk

Insurance Act to support them, particularly if they have dependents; nor was it intended it should do so. Every consideration requires that he should secure permanent employment at desirable wages in the position for which he is best fitted or for which he can become best fitted. Otherwise his career will consist of alternate periods of more or less undesirable employment, idleness, trying to live on his pension, and picking up an occasional job. No self-respecting veteran of this great war can afford to be placed in this position. There is only one escape, and that is to make your future safe for itself, if you need training, by taking it from Uncle Sam, through the Federal Board, before you go home to stay.

War Jobs

I know fellows who are holding war jobs at good wages. Why not take one of these now and not bother about training? The temptation to do this is very strong while war prices prevail, especially as pay is high because there is a lack of help and the kind of help you can give will not be looked at too closely. But jobs commanding war prices and employing large numbers of partly skilled or unskilled hands are not always going to exist. They are soon going to shrink to normal conditions. What then? The answer is unfortunately very simple, although it will be fortunate for you if you are convinced by it and see in time that it is true. The law of supply and demand is not going to stop working because you have been a soldier and have incurred a disability in defense of the country. If there is only paying work for so many hands the supply of hands must be cut down. When this happens, if you cannot turn out as much or as good work as a sound man the sound man is going to keep his job and you are going to lose yours. That means you will be out of a job, and you will become discouraged as you go from one job to the other and meet with rebuff after rebuff.

How may I get training by the Federal Board? Any soldier or sailor disabled not by reason of his own willful misconduct, whose disability is severe enough to be really a handicap in securing employment, is eligible for training. To prove your eligibility you must fill out Bureau of War Risk Insurance Form 526, which is an application for compensation. This application will contain all the evidence needed to determine whether or not you are eligible for compensation and therefore eligible for training. This application must be delivered to the Federal Board or one of its representatives or sent directly to the War Risk Insurance Bureau. Upon its receipt it will be carefully examined to determine whether or not you may be trained. If so immediate steps will be taken to provide for you any training for which you have applied and which has been approved by the Federal Board.

While I am in training who will pay for my instruction? The Federal Board for Vocational Education will bear the entire cost of your training. It will pay for your tuition; it will furnish you with books and other necessary supplies, and it will pay all other expenses that may arise in connection with your training.

What support shall I get as a student while I am in training? During the time you are following a course of instruction with the Federal Board you will, if you are a single man without dependents or a man required by his course of instruction to live apart from his dependents, be paid by the Government at least $65 a month. You may be paid more. If, for example, you received more than $65 a month as pay for your last month of active service, you will receive this same pay during your entire course of training. Furthermore, if your disability is such that your monthly compensation under article 3 of the War Risk Insurance Act is greater than $65, you will, of course, continue to receive this sum, whatever it may be, during your entire course. If you are married you and your wife together will receive $75 a month from the Government, provided you live together while you are taking a course of instruction. If your course is such that you must live apart, the Government will pay you $65 a month and your wife $30 per month. The larger your family the larger the amount paid by the Government for its support, whether living with you or separately from you while you are being educated. Any representative of the Federal Board at a hospital or at the central office or at a district office of the board will be pleased to tell you the exact amount you and yours will be paid if you will state orally or by letter the size of your family. The basis for a man's support will always be the total amount which he receives from the War Risk Insurance Bureau for all purposes, including pay, compensation or insurance. When the amount paid by the bureau to a disabled man under the War Risk Insurance Act and the Vocational Rehabilitation Act does not equal the minimum amount guaranteed for the support of the man as above indicated the Federal Board will supplement the payments of the Bureau to the extent necessary to meet such guarantee. In the case of a commissioned officer undergoing training the support paid by the Government will always be the pay for the last month of active service, an amount always in excess of the minimum guarantee of $65 a month.

Training at Govrnment Expense

For what occupations will the Federal Board be willing to train a disabled man at Government expense? If he needs to be trained for an occupation, the Federal Board will train the disabled man for any occupation which he desires to follow, provided his previous experience and ability are such that he can do successful work in the occupation and provided it is possible for the board to secure anywhere, in school or shop or farm or office or elsewhere, the facilities necessary to train him successfully for the occupation.

Who will take care of my dependents while I am in training and what support will they receive? The same allowance and allotment will be paid to your dependents as was paid to them while you were in the active service. If you are married your wife will receive $30 a month. If you have a wife and child, they will receive $40 a month, and $10 will be paid for each additional child up to three. If you have a mother dependent upon you she will receive the same amount she received while you were in the service. If you were a commissioned officer you will be expected to maintain your dependents out of the amount paid to you while you are undergoing training, which will always be your pay for the last month of active service.

What will be the difference between my support while in training and my compensation under the War Risk Insurance Act? While you are taking the course you will be rated as a temporary total disability, for the reason that you will be earning nothing during this period. If you do not follow a course of instruction with the Federal Board your rating will depend on your physical condition, and your compensation under the War Risk Insurance Bureau will be adjusted accordingly. If you take the course of training you are guaranteed not less than $65 a month for your own support. In most cases your compensation under the War Risk Insurance will be less than half of this amount. Furthermore the allowance for your dependents continues while you are in training with the Federal Board the same as if you were in the active service. This is not true if you do not elect to follow a course. If you are interested you may get the exact figures regarding your case from any representative of the Federal Board or by correspondence with the district or central office of the board.

Will the support received by my dependents while I am in training be continued after my instruction is completed and I have entered upon employment? No. The Government expects to train you so well that you will earn more money after your instruction is completed than you did before you entered the Army. In order that you may be trained the Government has arranged to support your dependents while you are following a course and earning nothing. When your instruction is completed, however, and you are trained so that you can again earn good wages the payments to your dependents will stop. As previously pointed out allowances to your dependents are continued after your discharge from the service only in case you elect training with the Federal Board.

Question of Payment

If the nature of my disability is such that I not only receive compensation under the War Risk Insurance Act but also in addition an annuity under my insurance policy, will the Government take into consideration my annuity in providing the minimum guaranty of $65 per month for my support while in training? The minimum amount of $65 is made up from payments by the board to supplement compensation paid by the bureau in cases where this compensation is less than $65. The board's payments for support are restricted to those cases where the man has no other financial support than his compensation received from the bureau. If in the opinion of the board the annuity received by you makes it unnecessary for the board to supplement the amount paid to you by the bureau as compensation no supplemental payment will be made by the board and the amount paid for your support will in that event be the compensation received from the bureau as compensation and your annuity under your policy.

In what manner does the Federal Board go about training me for an occupation? As soon as the Army authorities have decided that any disabled man is to be discharged from the hospital and returned to civilian life it becomes the duty of the Federal Board, through its vocational advisers in hospitals, to deal with the problem of training him and of placing him in civilian employment. This task involves five possible steps: Election by the disabled man of a course of training; preliminary training to fit him for a definite occupation or pursuit; a probationary period of employment in that occupation or pursuit; placement in suitable employment in the occupation or pursuit, and follow-up work to safeguard his interests.

I want training. How shall I get it? Ask the help of the vocational adviser representing the Federal Board who may be at your hospital. Ask him for copies of the publications of the Federal Board in which you may be interested. He will tell you all about them, particularly about the monographs giving information about the various occupations and groups of occupations. He will furnish you information about your compensation and how to go about making your application for it so as to establish your right to compensation and your eligibility for training by the Federal Board. If you have no contact with the vocational adviser in the hospital, you probably will find other publications of the Federal Board in the hospital library. In addition you should write the office of the Federal Board in the district in which your hospital is located or in which you are residing as a civilian, stating your case and asking for information and advice. You will receive a ready response from the agents of the board.

Women on Munition Work

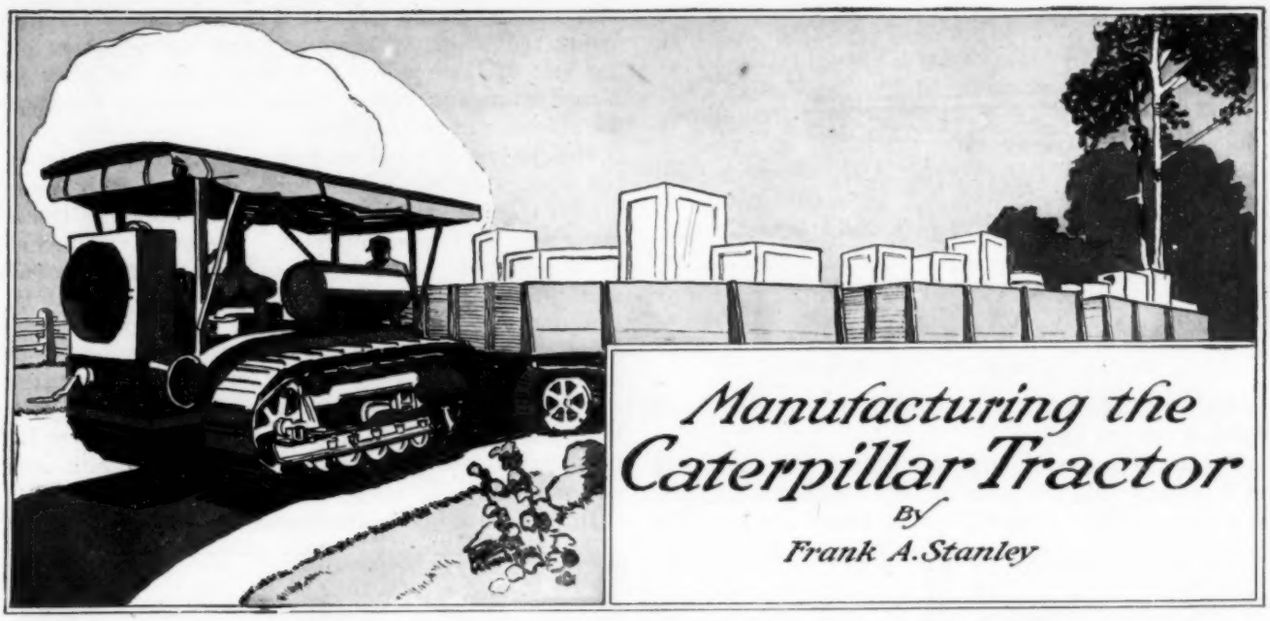
By B. Caldwell

The Hart-Parr Co. munition and tractor works, Charles City, Iowa, has employed women in the machine shops for some time, so that this kind of labor is now beyond the experimental stage in this factory. Women are working on milling, hand-screw and drilling machines; as coremakers, tool checkers, tool sharpeners and assemblers for small tractor parts, etc.

A woman who had had no previous machine or tool work training and who had been at office work and did not know one tool from another turned out more work the first day than any man had previously done on one of the machines. There are several women coremakers and they are the only ones on piecework. The latest branch of work here for women to enter is that of sweeping. Where there is much routine and repetition work women have proved that they can do as much as men, but where there are numerous changes to be made it has been found that men do better, as it requires more experience and skill in and knowledge of machinery.

Women are employed on the lighter machines and they are giving excellent satisfaction both as to the grade and quantity of work turned out. They are also doing some operations that require considerable skill and they have learned them easily. On the whole their work averages well with that of the men. One foreman said, "It takes women a while to learn, but they do it better than men after they get started."

Last month an editor of a city daily published in Des Moines, Iowa, entered the munition works of the company, donned the "unionalls," was assigned a machine incognito, obtained several days' experience in muntion work and made observations of the tasks women are performing in a machine shop line.



Manufacturing the Caterpillar Tractor

By

Frank A. Stanley

IV. Making Connecting Rods

The methods employed for making connecting-rods for "Caterpillar" tractors include the straddle-milling of the ends, the boring of the seats for the bushings, the drilling of the cap-bolt holes, etc.; splitting the caps, finish boring and reaming.

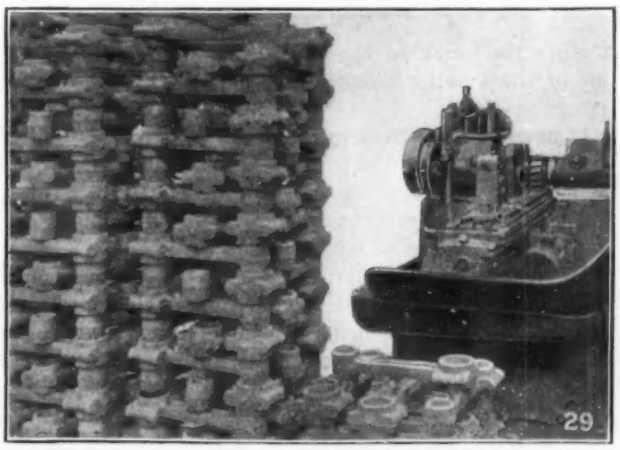
IF ONE desires to see connecting-rods manufactured on a high-production basis he will find ample opportunity at the Holt plant in Stockton, Calif., a suggestion of the manner in which such parts are put through in big lots being conveyed by the halftone, Fig. 29, herewith, which shows a considerable number of rods ready for finishing on the ends in the duplex milling machine seen at the right.

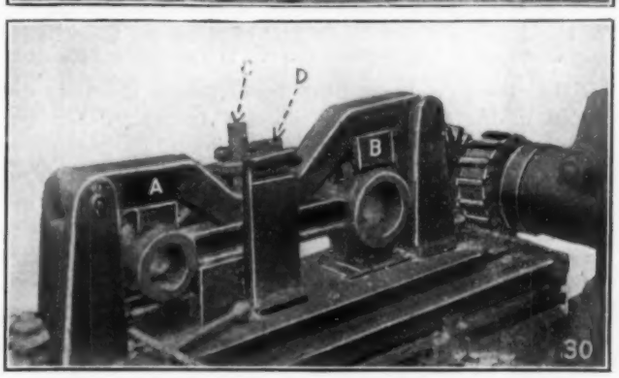
The fixture for this operation is shown more distinctly in Fig. 30, which represents the work and fixture from the side and also shows the type of milling cutters employed for the purpose of facing the rod ends.

As indicated the rod rests in V-supports under the ends and is held in position by two pivoted clamps *A* and *B* over the top which swing down from opposite ends of the fixture and which carry a pair of V-blocks for gripping the rod tightly when the swinging arms are forced down by the two screws *C* and *D* in the locking strap which is slipped into grooves in the brackets at the center of the fixture.

Two milling cutters of the inserted-tooth type are used on the work, both of them being visible in the illustration. The form of the block seats under the connecting-rod locates the work centrally, so that after the machine is once set a uniform amount of stock is removed with each cutter. The rods are drop-forged, and the general form and important dimensions of one size and class of rods are shown by Fig. 31. In all cases machine operations have been developed to facilitate manufacture, and produce most satisfactory results. The small ends of the rods are fitted with manganese-bronze bushings.

The boring and reaming of the rod ends to receive the bushings, which are themselves afterward bored and reamed when in place, are accomplished in the fixture shown in Fig. 32, which is used on the long table of a four-spindle gang-drilling machine. This fixture is made up of housings for carrying the tool guide bushings and with a separate holding base for mounting the work. The latter is made in duplicate for each pair of spindles, so that while one is in use





FIGS. 29 AND 30. STRADDLE-MILLING AND FIXTURE

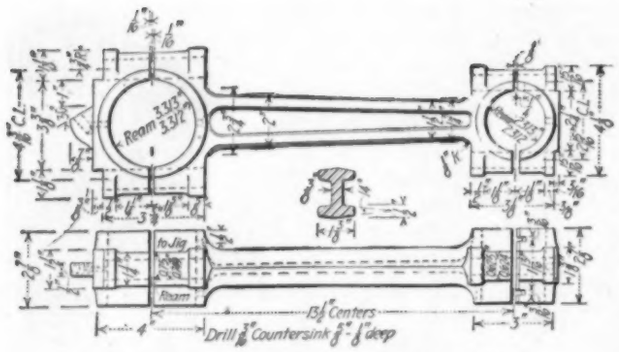


FIG. 31. TYPICAL CONNECTING-RODS

under the spindles the other is ready for the setting of another rod for boring.

The method of gripping the rods in the device is well brought out and requires no special explanation. It will be noticed that limit plug gages are used for

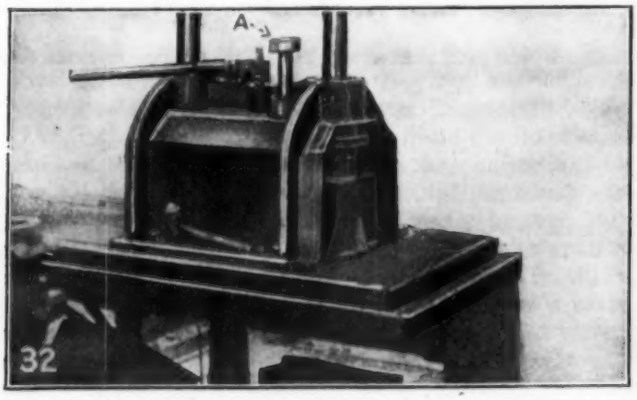


FIG. 32. FIXTURE FOR BORING AND REAMING CONNECTING-RODS

holding the work to the specified degree of accuracy, one of these plugs being represented on the top of the fixture at *A*.

If now we refer back to the detail drawing of the rod in Fig. 31, we shall find that the limits called for for the reaming of the holes leave a latitude of 0.001 in. only. For the larger sizes of rods there is an allowable variation in this respect of 0.003 inch.

In drilling the holes in each end for the cap bolts four spindles of a multispindle drilling machine are used. Two rods are held at once in the one drill jig, which takes care of the drilling of both large and small ends of the rods. The rod is held on one side of the jig with its large end up for drilling and then changed over to the opposite side where it is held small end up for the drilling of the other pair of holes for the smaller end.

After the bolt holes have been drilled the rods are placed in the fixture, Fig. 33, for facing off the nut seats and sawing off the caps, an operation performed with the gang of cutters and saws shown on the arbor in this illustration.

Here the connecting-rod is held on two plugs which locate the work horizontally across the table, the plugs being part of a fixture which is in the form of an angle plate made as low as possible to bring the operation near the table and so eliminate chatter and vibration. The gang of cutters is set up with proper spacing to bring the splitting saws central with the ends of the rods and the facing mills at correct distances for finishing the bosses to height. After the operation on one side of the rod has been performed, the work is turned over and passed through again to complete the process on the opposite side.

The jig in Fig. 34 is used for drilling the oil holes in the caps. Here the cap is slipped over two short locating pins which fit the bolt holes, and secured by tightening the hand screw in front. The hole is drilled at an angle from the outside and another hole drilled straight in from the interior of the cap to meet it. Bushings for the drills are located at the points indicated and the exterior of the jig body is angled off to provide resting points on which it stands at the requisite angles to present the work for drilling each hole straight down. It is a simple form of roll-over jig that enables the operation to be performed with ease and rapidity.

In Fig. 35 a jig is illustrated for finish-boring the

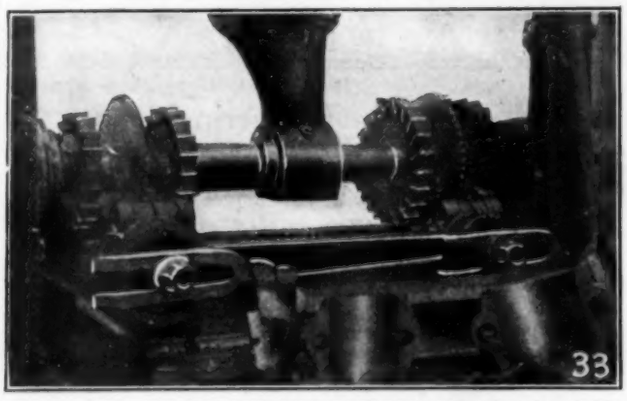


FIG. 33. FACING BOSSES AND SAWING OFF CONNECTING-ROD CAPS

bushings in place in the rods. This might perhaps be better designated a reaming jig, as the tools used remove but a slight amount of metal from the bronze and special babbitt liners or bushings. The jig is shown in plan, section and elevation in Fig. 36.

It may be explained that the rod is first placed in

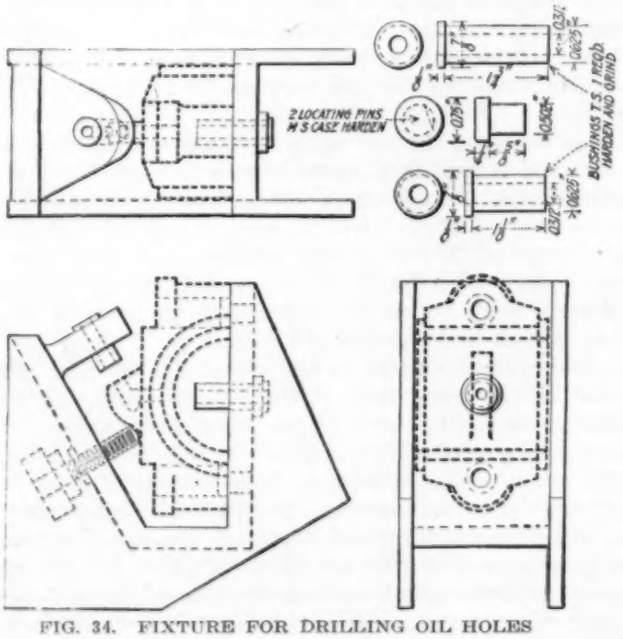


FIG. 34. FIXTURE FOR DRILLING OIL HOLES

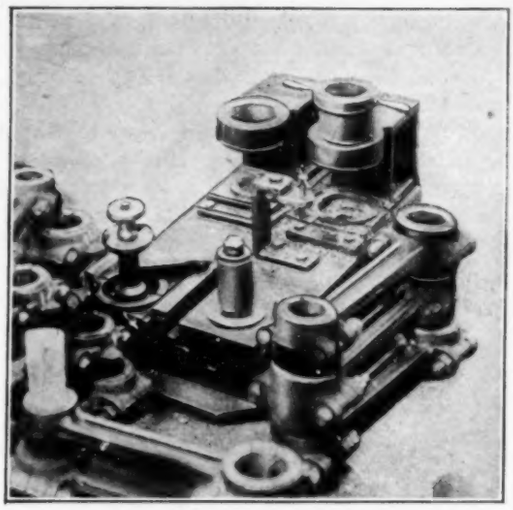


FIG. 35. JIG FOR FINISH-BORING AND REAMING CONNECTING-RODS

the position shown at *A*, where it is located by the large end for the finishing of the small end under the jig bushing. The liner, or bushing, in the large end projects slightly, and this enters into a seat formed in

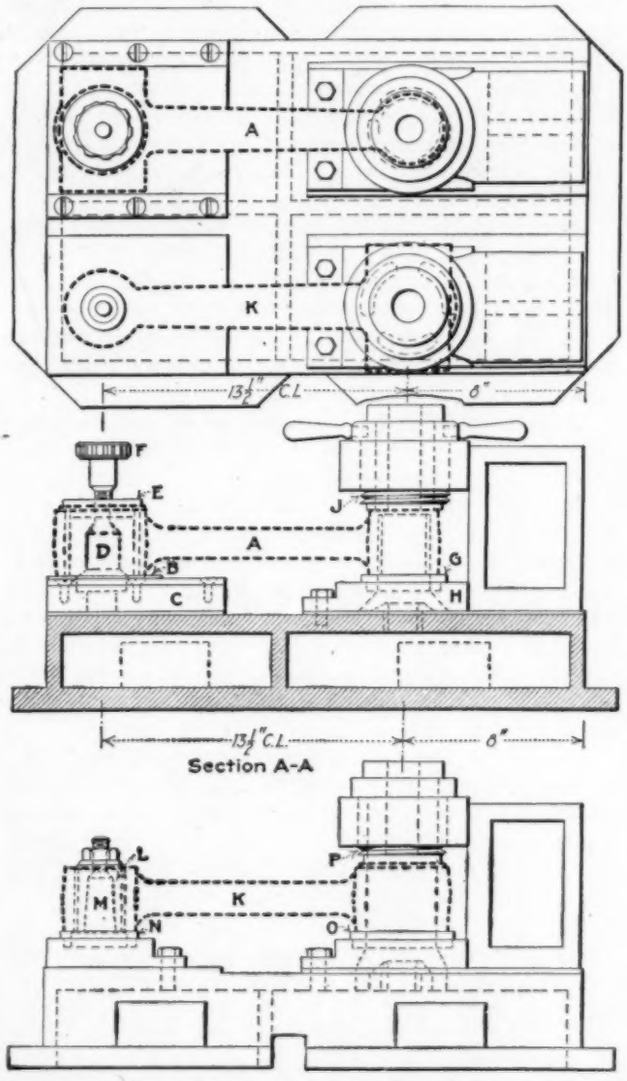


FIG. 36. DETAILS OF FINISH-BORING AND REAMING JIG

a shallow ring *B*, which in turn is carried on block *C* mounted on the jig base.

A post *D* is fitted in block *C*, and this carries a cone-shaped washer *E* which clamps the rod end when the notched hand nut *F* is tightened. With the rod set in the position noted, the small end rests with the projecting end of its bushing seated in ring *G*, which is fitted into block *H* fixed on the baseplate by cap-screws. But block *C* for the large end of the rod

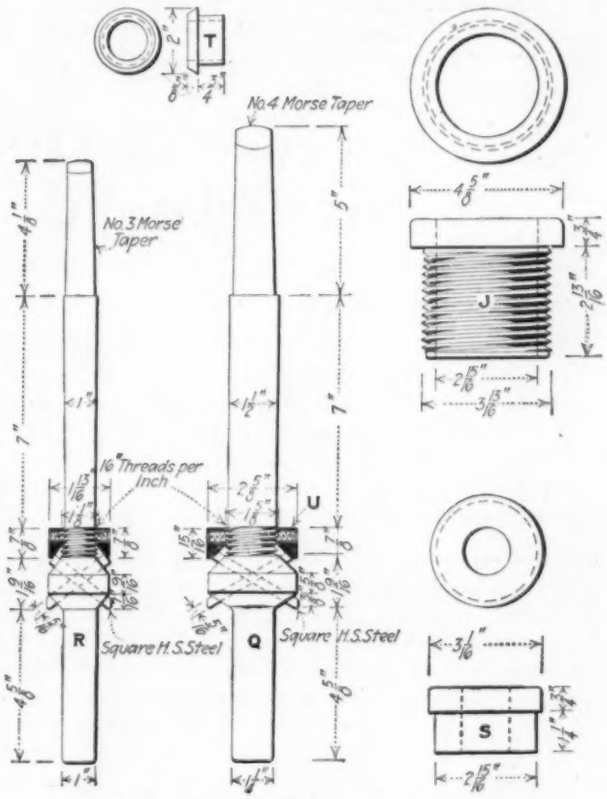


FIG. 37. REAMING TOOLS AND BUSHINGS

is in the form of a slide which, if so required, may adjust itself longtudinally to compensate for any slight discrepancy in the center distance of the bushings at this stage of the work; that is, the small end bushing establishes the exact position of the rod for this first location on the jig by fitting into the locating ring *G* which is central with the boring-bar guide bushing, while the outer end of the rod clamped to the sliding support *C* adjusts itself accordingly. The latter acts therefore merely as a carrier for the big end of the rod, the exact center distance between bushings being secured later when the rod has been finished at the small end and transferred to the second position on the jig.

With the work set in the first position indicated at *A*, it is clamped for finishing the small end bushing by the threaded guide bush *J*. After the finishing tool has been run through to size the bushing in the small end of the rod it is transferred to the second position shown at *K*, and here it is located positively by the small end the bushing of which fits snugly over a split sleeve *L* mounted upon a taper stud *M*, on which the sleeve is expanded to grip the interior of the work when the nut is tightened at the top of the taper stud.

In this second position the connecting-rod rests upon the two shallow seating rings *N* and *O*, and with the

boring-tool guide bushing *P* brought down on the large end of the work the job is set for finishing the large end, which must now, with this fixed position of the rod, come to the exact center distance required from the small end.

Not the least interesting part of the outfit is the cutter bar and inserted tools with which the work is brought to exact size of bore. The two bars are shown at *Q* and *R*, and the guide bushings for the bars are seen at *S* and *T*. The body of the bar is guided in the bushing *S*, which is adapted to fit into threaded bush *J*, and the smaller or pilot portion of the bar fits in bushing *T*. The top of this bushing is beveled to an angle to shed chips from the work and allow them to pass down through the small slots that are purposely formed in the base.

The two reaming blades, or cutters, carried by the bars *Q* and *R* are placed in a novel manner in the body of the bar. The tools cross one another in their holder and their upper ends are beveled to match the inner surface of an adjusting ring *U* by which the tools are set out to the desired cut. When set they are secured by the small cone-pointed screws tapped in from the outside of the body.

Disobedience of Orders by Employees and Its Relation to Compensation

By CHESLA C. SHERLOCK

The impression prevails among employees in general that the compensation acts always operate to their advantage without imposing obligations upon themselves. That this impression is erroneous and that in many cases the duty of "watching his step" devolves upon the employee are plainly set forth in this article.

IF A soldier disobeys orders he is in danger of court-martial and that always has one of two results: dishonorable discharge or punishment or both. The industrial worker belongs to an organization with a probably less severe discipline in ordinary matters, but when the safety of the individual or the organization is imperiled the discipline of the industrial worker should be as good as that of the soldier; he should either obey the orders given him by his superior or else pay the penalty.

There has always been more or less laxity among civilian workmen in obeying orders. Rules are too often taken as a matter of course, often being ignored from the moment that they are posted by the proper authorities.

If the employer hires several hundred men he cannot, or the corporation cannot, go around and enforce the discipline necessary to provide for the safety and welfare of the workmen as a whole. The enforcement of shop and factory rules and orders must depend upon the spirit of the workmen and the individual morale of the organization.

Employers have come to recognize this fact. They are getting attention and obedience out of their employees by giving them object lessons in what happens to a workman who has no regard for the orders of his superiors. They are showing the workmen what happened to Bill Smith when he failed to heed his foreman's warning as to the operation of an emery wheel without the use of a guard provided for it; they are showing the workmen how John Jones' arm looked when he got blood poison after failing to report a thumb scratch to the company's physician as required by the shop rules. While these object lessons are doing their share toward arousing the proper spirit in the minds of obstinate workmen there are others—the know-it-all kind—who refuse to come to terms until some disaster has overtaken them.

It is remarkable how supremely confident these workmen are as to what they could do if they were "to take the matter to law." They have an exaggerated idea of the liability of employers and corporations in case they injure a workman. If they have a peculiar notion about how to operate a certain appliance (a fault that many workmen cultivate because of improper instruction in their apprentice days) they will not listen to friendly counsel from fellow workmen, but will rest their chances with the law.

The regrettable part is that these workmen are usually poorly informed on the law in such cases. They have either sought cheap legal advice or else they have formulated their theories entirely from their own imaginations. If they only knew that nine times out of ten the law is against them they would assume a different attitude.

When there is need for an exercise of judgment, and the employer or his foreman has exercised that judgment and given the workman orders to do a certain thing, which the workman fails to do or does in an entirely different way, resulting in his injury, the courts are practically unanimous in holding against the workman. Of course no workman would be required to do something obviously dangerous unless he volunteered to do it of his own free will. No workman can be expected to obey orders that arise out of the whim or caprice of his employer, so the courts have said. The order must be reasonable and likewise sensible.

At common law the failure of a workman to obey a rule or order of the master was considered so serious an offence that it often cut him off from recovery for his injuries, although frequently the existence of the rule or order had only a remote connection with the cause of the injury.

A great deal of misunderstanding exists as to the effect of the workmen's compensation acts on this branch of the law. Just what result do these laws have upon the employee's duty to obey his employer's orders and rules?

In the compensation acts we find that the basis of damage has been changed. We no longer assess the

damage to the party at fault entirely. The basic thing is that someone was injured and that someone is entitled to compensation, no matter how he was injured, provided it arose in the course of and out of his employment. It would seem at first glance that the compensation acts would render null and void any rules of law requiring obedience to an employer from the employee. But such is not the case. Most of the acts provide that a workman cannot recover compensation if his injury is the result of serious and wilful misconduct on his part. The question is then naturally asked, Is disobedience of orders "serious and wilful misconduct?"

This is a proposition that has caused serious differences of opinion among authorities. There has been constant appeal to the courts, and it is only their decisions that can throw light on the question. The result of the past few years has been to strengthen and clarify the decisions of the authorities, so that it is now practically well settled just what is the law on disobedience of orders.

Employees Less Familiar with Law

Most employers are thoroughly familiar with the common-law rules regarding this and kindred subjects; but it is equally desirable and important to bring this knowledge forcefully to the attention of the workmen. It may be said that if the know-it-all workman knew something about the law of master and servant, especially in view of the compensation acts, there would be better discipline in factories and shops and fewer accidents.

Injury Through Disobedience

In a Wisconsin case the applicant was injured by letting his fingers come in contact with a saw while he was attempting to adjust the rollers of a machine. He was employed in the woodworking department of the factory and defendant claimed that he was outside the scope of his employment at the time of the injury because he had been repeatedly warned and ordered not to tamper with the machine in any manner. It was shown that the injured man was not acquainted with the English language, that probably he did not understand the orders and rules regarding adjusting machines while in motion. The Industrial Commission held that the evidence did not disclose sufficient facts to show the applicant was guilty of wilful misconduct such as to take him outside the scope of his employment at the time of the injury and awarded him compensation.

Injured by Unexploded Blasting Charge

In a California case the applicant was working in a mine and received his injury by striking a boulder in which there was an unexploded blasting charge that had been placed there the day before and that failed to explode. The plaintiff had attempted to crack it with a sledge with the result mentioned. The defendant claimed that the applicant had been specifically ordered by his foreman not to touch the boulder. The applicant claimed that the foreman had come and probed the hole in the rock with a stick and had then given him specific orders to break it up. The commission held that this did not constitute wilfulness on the part of the applicant; that the injury was likely due to the ignorance of the applicant of the danger and not to wilful misconduct. There was evidence to show that the applicant had slight knowledge of English and he might easily have supposed that the foreman had removed the charge when he examined the boulder and gave him orders not to touch it.

In another California case the applicant was employed operating a wood-planing machine. He lost several fingers through a failure to use certain safety devices that had been installed and which he had been instructed to use. Said the commission:

Rules Must Be Enforced

"To disregard the instructions of an employer, where such instructions are given merely in the form of cautions and where repeated violations of such instructions are known and permitted without penalty and without positive insistence upon obedience, does not constitute such obstinate or perverse opposition to the will of the employer as amounts to wilful misconduct. To hold otherwise would be to open the door for the employers to impose safety rules upon their employees with a tacit understanding that such rules need not, so far as the employers were concerned, be regarded if the employees chose to do otherwise, but that if the employee was injured while disobeying any such instructions he would be deprived of compensation. An employer cannot be allowed to impose two standards of care upon his employees, one for the ordinary conduct of his business and the other as a test of liability under the Workmen's Compensation Act in case of accident.

"There is one other feature of this case that deserves consideration. It is that the applicant is a lad of nineteen years of age and not as ripe in experience or mature in judgment as the journeyman worker of a greater age. When, for any reason, an employer puts such a workman in charge of dangerous machinery he owes to him and to the general welfare that a high degree of supervision be exercised over him and that observance of safety rules shall be required with greater certainty and vigilance. To fail of exercising such control is, in some measure, to participate in any consequence which may follow."

A Point for Employees to Notice

This is a point that employers might note to their advantage. Under the workmen's compensation acts an employer cannot escape liability by posting safety rules and then forgetting all about them. The mere violation of a safety rule will not deprive a workman of compensation. The violation must be such that it will take him outside the scope of his employment.

If an employer formulates a set of rules and requires the strictest obedience of them so that the instant an employee is caught violating them he is discharged without any more ado about it, then the employer is in a much better position than if he had been lax in enforcing them. It is a question whether or not a workman carries himself outside the scope of his employment the instant he violates his employer's rules in a shop where the strictest obedience is maintained. It would seem that such is the case, and indeed some of the courts have so held.

Many conditions must be present before a viola-

tion of rules will deprive a workman of compensation. It must be remembered that the real offense the workman has committed is "serious and wilful misconduct." If a workman is guilty of such misconduct, even though he be doing his regular work, he is removed, by fiction of law, from the scope of his employment, so long as he continues in the forbidden path. If injury results during that interval, then he cannot hold the employer for the payment of compensation.

The courts have said, first of all, for a workman to be guilty of misconduct in the case of violation of rules there must be a rule in actual existence. This rule must be in such existence that the workman knows of it or has had it called to his attention. It cannot exist merely in the mind of the employer. If it is in existence, it must be where the employee can see it or have it called to his attention. This requires that it be posted in a conspicuous place in the shop or factory.

Many employers carry out the provisions of the law to this extent. In the press of work they forget the rules themselves and allow observance of them to fall into disuse. But the courts have said that they must go farther; they must enforce their rules to the letter and must not permit a single violation.

If an employee violates a safety rule and the employer knows it and allows the workman to go unpunished, then all other workmen in the shop or factory have the right to violate any or all of the rules without being declared outside the scope of their employment in case they suffer injury through an accident.

There must be obedience, and the authorities seem agreed that it must be as strict and as thorough as that required in military service. Every violation of the safety rules must be detected and punished. Then, if a workman, knowing that such a violation is not only hazardous to his own safety but that he will be punished by his employer, violates a rule he is guilty of wilful misconduct and cannot recover compensation when injured.

An Illinois Judgment

The Illinois Industrial Board, however, takes the opposite view. In a case decided by it in which a workman lost several fingers because he had not obeyed the rule of his employer in operating a certain machine the board said: "We doubt very much whether the facts set up in the stipulation amount to wilful misconduct on the part of the employee. The violation of an order, specific or general, does not amount to wilful misconduct or take one out of the course of his employment if it is done in good faith and in the theory that it is for the best interests or promotes the business of the employer."

This statement must be taken with its qualifications, however, as the Illinois board technically had no right to decide a question of wilful misconduct, as the Illinois statute makes no reference to it. Since wilful misconduct has not been recognized by the legislature in Illinois a workman might be guilty of it and still receive compensation for his injuries. The dictum of the Illinois board is therefore mere surplusage, so far as the real authority of it is concerned.

The California commission recognized the fact that a violation of a rule or a disobedience of orders may amount to wilful misconduct when it said: "Wilful misconduct may consist of the wilful violation of a rule or order made for the employee's own safety, or the safety of others, such rule being prescribed by a power having authority to make such rules, and enforced with diligence." The commission has held, however, in a certain case that mere good-humored disobedience of a rule or order is not sufficient to amount to wilful misconduct, but the condition of disobedience must be that of "being refractory or intentionally or premeditatively disobedient to any rightful authority over him." We cannot say that this stringent rule would apply generally to cases in other states.

In another case the same commission has held that a disobedience of orders, in an effort to further the interests of the employer, cannot be held to be "wilful."

Injured While Cranking Car

In a certain case the employee was injured while cranking his employer's car. He had been given orders not to attempt to crank the car, but he desired to move it so that he could wash it. While cranking it he suffered the injuries for which compensation was claimed. The commission, after reviewing the evidence, said: "Even admitting that instructions were given him not to crank the car, a matter for serious doubt, still we do not think that his action in this respect amounted to such wilful misconduct as to bar him from receiving compensation. He attempted to crank the car, it appears, not from a wilful desire to disobey an order, but from a wish to further his employer's interests by washing a certain car in order to have it ready to go out. Such misconduct, if any, cannot be construed as wilful within the meaning of the act. We think therefore that applicant is entitled to compensation."

In still another case the commission said: "The injured employee must have manifested a spirit of obstinate refractory opposition to the intent and purposes of the employer in making the rule or issuing the order. The disobedience of such rule must be intentional, premeditated and not to be persuaded by counsel, advice, command or instruction, and must have been actuated by a bad purpose and have proceeded from a conscious motion of the will in opposition to the authority of the employer."

Elements Which Should Be Understood

Taking this statement as final on what constitutes "wilful misconduct" on the part of an employee in disobeying an order or rule we naturally find these elements present in every case: (1) The existence of a rule, which is reasonable, simple and clear; (2) knowledge of that rule on the part of the employee, and (3) enforcement of the rule at all times.

On the part of the employee, there are these elements: (1) Knowledge of the existence of the rule or order; (2) deliberate, wanton or reckless disregard of it, and (3) disobedience even in the face of consequences or direct command; such obstinacy as cannot be controlled by the employer.

Sebastian 10-In. Motor-Driven Lathe

The name of the manufacturer of the lathe shown on page 915 was inadvertently omitted. The machine is the product of the Sebastian Lathe Co., Cincinnati, Ohio.

How the 155-Mm. Howitzer Is Made—II

By J. V. HUNTER
Western Editor *American Machinist*

This article covers operations on the tube from the receipt of the rough forging until it is ready for shrinking on the jacket. The operations, together with the tools used, are fully described and many of them are illustrated.

THE tube forgings, shown in Fig. 18 are first rough-turned and heat-treated at the forging plant. The remaining operations are carried out in the sequence indicated in the following list:

Operation 6—Hold by inside muzzle end, telltale, turn spots and bore for plug center in breech end and muzzle ends to a size. Transformation—Fig. 19. Machine Nos. 5011, 5012, 5021. Type—30 ft. by 18 ft. American lathes. Tools—Telltale, turning and boring tools, plug centers. Coolant—Soap solution 1 to 12. Cuts and feeds—Irregular.

Operation 7—Transfer heat number from breech end to muzzle end with ½ in. figures. Hold by muzzle end and rough-turn whole forging. Transformation—Fig. 20. Machine—Nos. 5013, 5014, 5015. Type—30 in. by 18 ft. American lathes. Tools—Profile attachment for lathe carriage; high-speed-steel lathe tools. Coolant—Soap solution, 1 to 12 mixture. Cutting speed—40 ft. per minute; feed, $\frac{1}{16}$ to $\frac{1}{8}$ in. per revolution, according to hardness.

Operation 8—Rough-bore. Hold by turned muzzle. Transformation—Fig. 21. Machine—Nos. 5024, 5025, 5026, 5027, 5028. Type—38 in. by 32 ft. LeBlond lathes. Tools—Boring bar, first and second cut boring tools. Coolant—Houghton's No. 2 cutting oil.

Operation 9—Rough-turn shrinkage surface. Machine—Nos. 5057, 5023, 5058. Type—30 in. by 18 ft. American lathes. Tools—Cutting tools, lathe profile attachment. Coolant—None. Cutting speed; 40 ft. per min. Feed $\frac{1}{16}$ in. per revolution, depth of cut, $\frac{1}{8}$ in. per revolution.

Operation 10—Grind thread surface. Machine—Nos. 5602, 20 in. by 96 in. Landis Grinding; 5603, 20 in. by 96 in. Norton Grinding. Stamp serial number on outside of muzzle ring, reading from breech end, and notify Government Inspection Office that tube has been assigned. Coolant—Special soap solution.

Operation 11—Machine threads. Machine—Nos. 5010, 5049, 27 in. by 6 ft. Reed-Prentice lathes; 5045, 20 in. by 16 ft. Reed-Prentice lathe. Tools—Thread and length gages, thread tools. Coolant—Small quantity cutting oil.

Operation 12—Trim threads. Stamp serial number on muzzle face. Stamp Government stamp on muzzle ring. See that star-gage reading has been taken and release to shrink. Search bore for defects of material in forging.

Operation 13—Shrink jacket on tube. Furnaces—Nos. 5103, 5104, 5105, 5106. Type—Tate-Jones electric furnaces; No. 5103, gas-heated furnace.

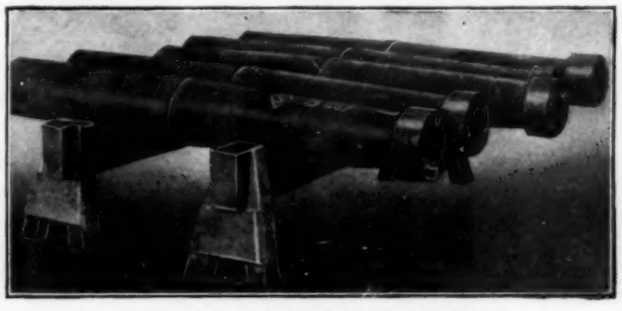


FIG. 18. ROUGH TUBE FORGINGS

The early operations connected with machining the gun tubes are very similar to the operations conducted on the jacket. Perhaps the tubes give a slight advantage by less eccentricity, but are, however, subject to an even more rigid inspection to detect any flaws that may occur in the bore. There is a somewhat greater degree of tolerance for boring the jacket because each tube exterior is made to correspond and fit its individual jacket. In the final boring of the tube, however, the tolerances are within very small limits, and if oversize or with cuts or scratches that cannot be scraped out it will be subject to rejection.

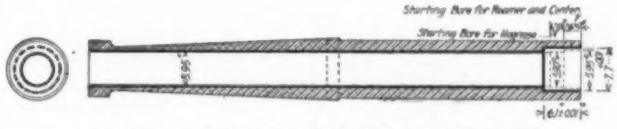


FIG. 21. TRANSFORMATION—ROUGH-BORE

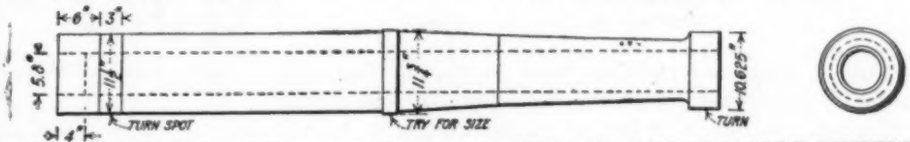


FIG. 19. TRANSFORMATION—TURN SPOTS ON TUBE AND BORE FOR PLUG CENTERS

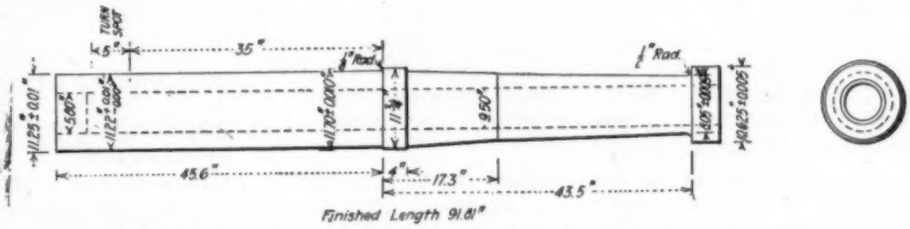


FIG. 20. TRANSFORMATION—ROUGH-TURN WHOLE FORGING

When the tube is mounted in the lathe for the first operation it is chucked on one end and held in a cat head on the other as in Fig. 22.

The rough-turning operation, Fig. 23, is done with a plug center in the muzzle end. There are two carriages on the lathe; the tool in the one at the right being guided by a taper attachment at the rear.

The boring, Fig. 24, is done on LeBlond gun-boring lathes and the boring tools used are all of the "wood-

packed" type. The wood packing is turned from 0.005 to 0.010 in. larger than the cut and wedges into it in a solid pressed fit.

The details of the boring head used for tube boring will be found in Fig. 25, and the high-speed-steel cutters are shown in Fig. 26. The general appearance of these boring tools is shown in Fig. 27, which also shows at *A* the end of the key which attaches it to the boring bar.

For boring the tubes and jackets cutting oil is used. This is flooded through the pipes indicated at *A*, Fig.

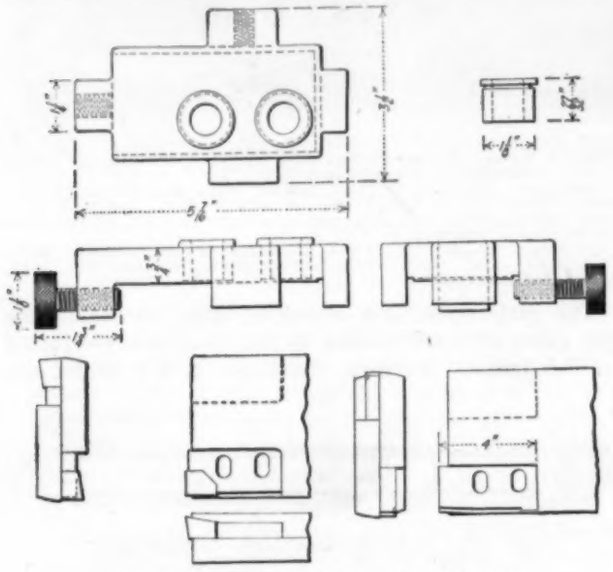


FIG. 26. CUTTERS FOR TUBE BORING

25, under pressures ranging from 35 to 100 lb., by powerful individual pumps for each machine that furnishes approximately 50 gal. of oil per minute to each tool. This high-pressure oil keeps the chip space on the tools clean, and rapidly carries the chips from the part being bored. This flood of oil is carried through the hollow boring bars to two ¾-in. brass tubes extending to the cutting blades. These tubes are laid in slots in the steel body of the boring head and protected by the wood-packing blocks.

The muzzle end of the tube is held in the lathe by a special form of driving fixture, shown in Fig. 28. This consists of a square-hinged clamping ring *A*, which carries four serrated holding jaws *B*. Back of this clamp is a centering collet *C*, which is milled with 10

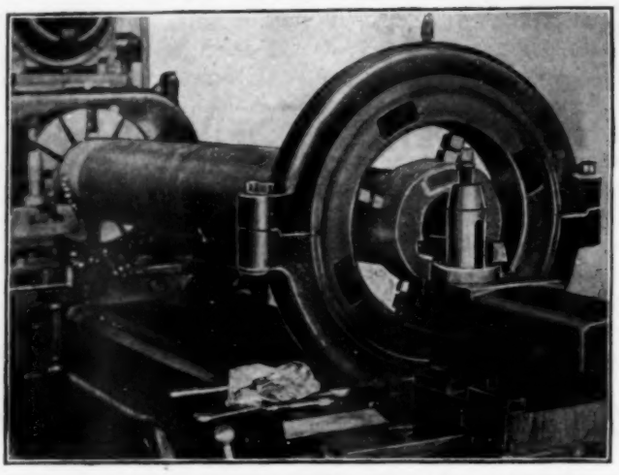


FIG. 22. TURN SPOTS ON TUBE AND BORE FOR PLUG CENTERS

slots on each face so that it shall be compressible. When the clamp *A* is pulled up against the pot head *D* the spring collet is forced tightly into the ground ring *E*, thus centering and aiding to clamp the tube in place. Since the flow of oil and chips is all out through the muzzle end of the gun the pot head *D* is made with

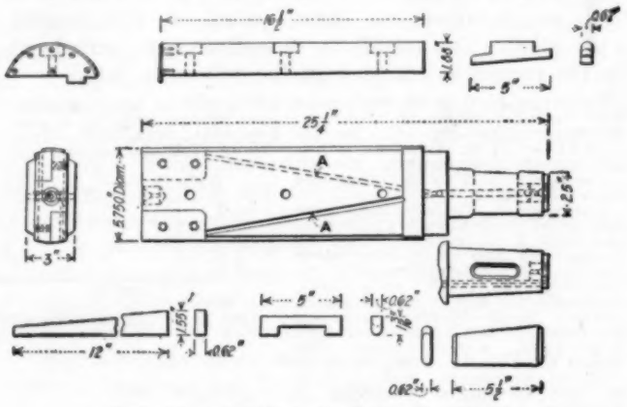


FIG. 25. DETAILS OF BORING HEAD

an open face to permit the oil and chips to flow through to the drain pan.

The speeds and feeds for the boring operations on the tubes and jackets vary with the change from roughing to finishing cuts. To insure the use of the proper feed and speed by the machine operator the shop has a small blueprint "cut chart" posted on each

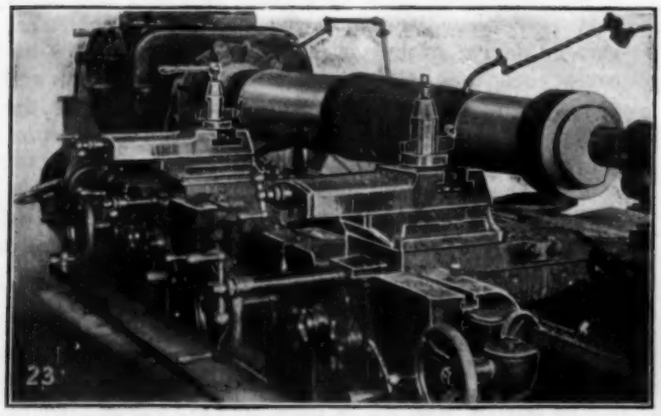


FIG. 23. ROUGH-TURNING THE TUBE

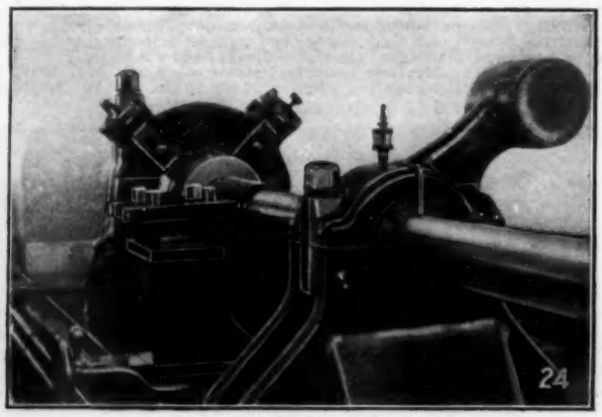


FIG. 24. ROUGH-BORING THE TUBE

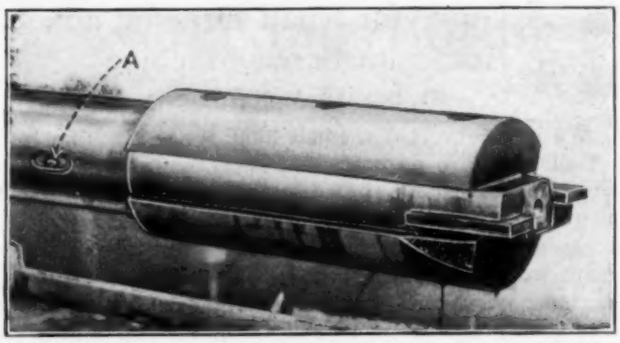


FIG. 27. CUTTING HEAD AND END OF BORING BAR FOR TUBE BORING

machine. The recommended feeds and speeds for these boring operations are as follows:

HOWITZER TUBE, PART II. OPERATION 8

Size of Reamer	R.p.m.	Peripheral ft. per min.	Feed	Cut
5.950	14	22	0.048	Rough

HOWITZER BODY, PART III. OPERATIONS 16 AND 17

Size of Reamer	R.p.m.	Peripheral ft. per min.	Feed	Cut
6.050	16	25	0.060	Rough
6.103	8 to 9	12.7-14.3	0.060	Finish
6.210	12	19.3	0.060	Rough
6.260	8	12.9	0.018	Finish
Gas check seat	7	11.2	0.014	Rough
			Finish with hand feed	

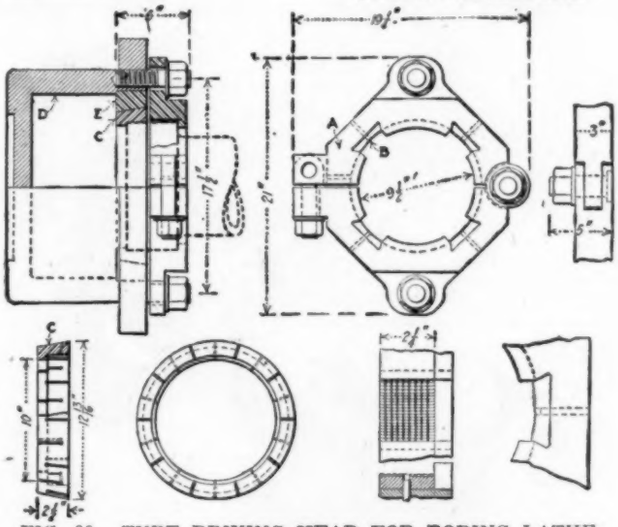


FIG. 28. TUBE DRIVING HEAD FOR BORING LATHE

After rough-boring, the tube is placed in a 30-ft. x 18-in. American lathe and a rough cut taken over the shrinkage surface for the jacket to prepare for the grinding operation. This cut is comparatively light and is made without the use of a coolant.

Grinding the thread surface, Fig. 29, which might also be termed the shrinkage surface, must be done so that both the surface and diameters of the tube conform to special "shrinkage drawings" which are prepared for each individual tube. It is more particularly a part of the jacket-shrinking operations and will receive more attention in that connection.

Cutting the Thread on the Breech End of the Tube

When the tube comes from the grinding machine it is ready for cutting the thread on its breech end. This serves to seat the tube in the jacket and must be cut with great care to fit the profile templets. The cutting tool and general view of the operation will be found in Fig. 30. After cutting the thread the ends must be chipped off and filed smooth to conform with the dimensions shown in Fig. 31, the necessary templets being furnished the operator for this purpose.

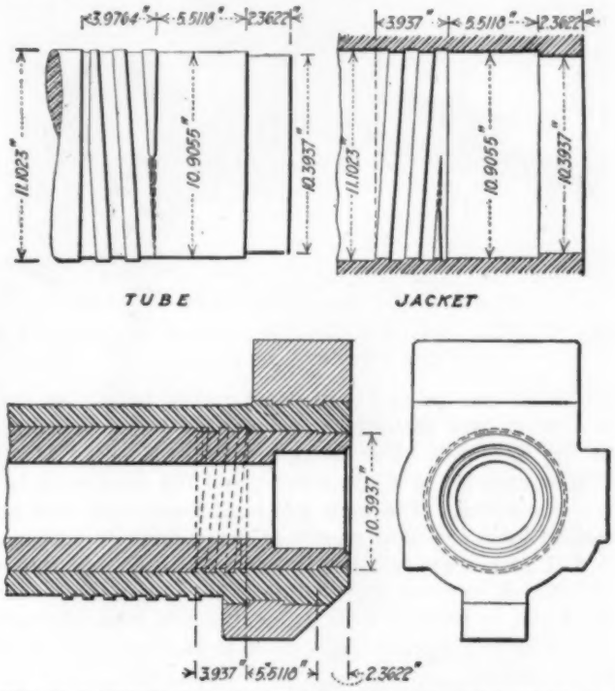


FIG. 31. LAYOUT FOR FINISHING ENDS OF TUBE THREADS

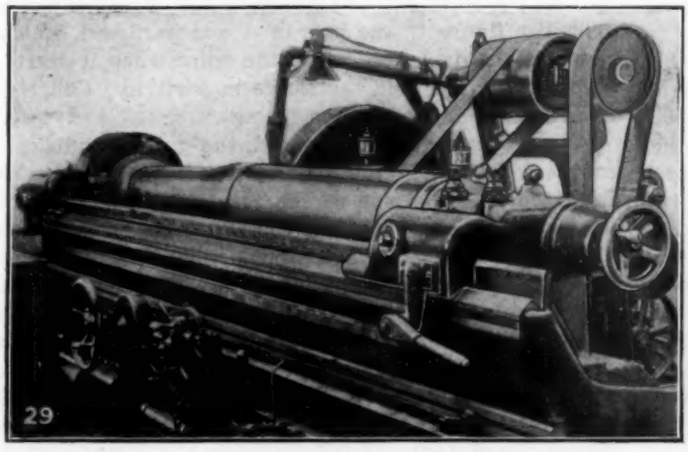


FIG. 29. GRINDING THE SHRINKAGE SURFACE

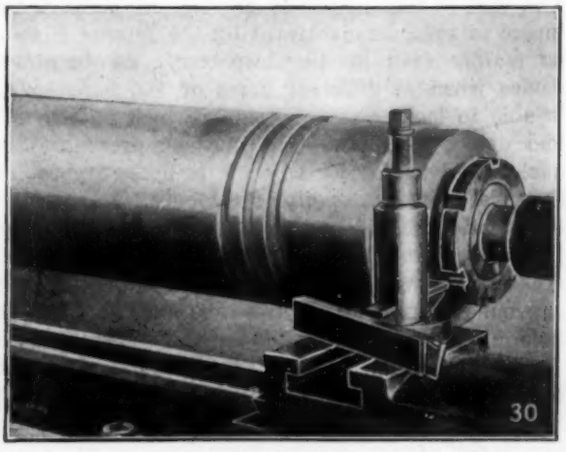


FIG. 30. CUTTING THE THREAD ON MUZZLE END

In laying out for the start of the thread on the tube no special position is required. The thread which was put in the jacket, however, is a different matter, because of the square end of this part, and the necessity for having the tube screw in to nearly a certain position. When starting the jacket thread a gage is used, but there is a small amount of leeway because the breech end is afterward faced off.

The feeds and speeds used in rough and finish turning both the jacket and tube are variable, depending largely upon how hard each individual piece of material is. Both are carried near to the limit as indicated by the heat of the chips as they leave the tool. For rough-turning, the cutting speed will average from 30

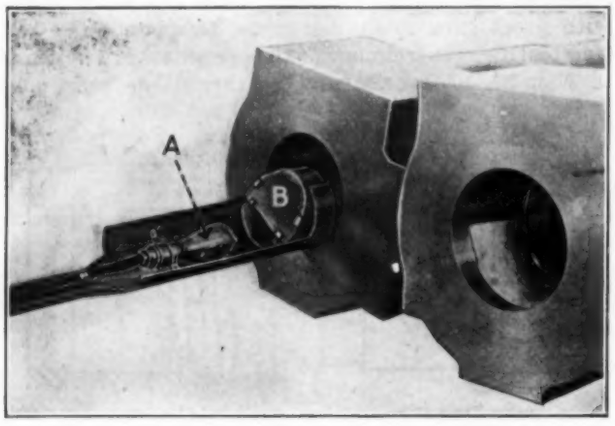


FIG. 32. LAMP AND MIRROR FOR INSPECTING THE BORE FOR DEFECTS OR FLAWS

to 35 ft. per minute with feed of $\frac{1}{16}$ to $\frac{3}{32}$ in. per revolution, and sometimes as much as $\frac{1}{8}$ in., according to the hardness. For finish-turning, the speed is 40 ft. per minute, or slightly over, and the feed is $\frac{1}{16}$ in. per revolution. The tools are high-speed steel and no stellite tools are used on either the jackets or tubes.

A 1 to 5 soap solution is generally used for rough and finish turning and drilling, but occasionally for one cause or another tools using it one day may be running dry the next. When used it is flooded on in a heavy stream.

Use of Light and Mirror for Inspecting the Tube Interior

Before the tube finally goes to the jacket-shrinking room it is subjected to a thorough bore search, Fig. 32. The bore is illuminated by the electric lamp *A* and its image is reflected backward by the mirror *B* so as to be plainly seen by the inspector. By turning this device when at different parts of the bore length he is able to look over every square inch of the interior and detect any flaws that may be present. Similar devices are used later when it is necessary to inspect the interior workmanship on the bore.

Attention should be called to the caution required to insure perfect electrical insulation on all wires and sockets used with the lights on tube inspection. Should a ground occur between the tube and wire a sufficient hole might be burned in the tube to cause its rejection. After this inspection and the acceptance of the diameters of the shrinkage surface by the Ordnance Department inspectors the tube is passed for shrinking on the jacket.

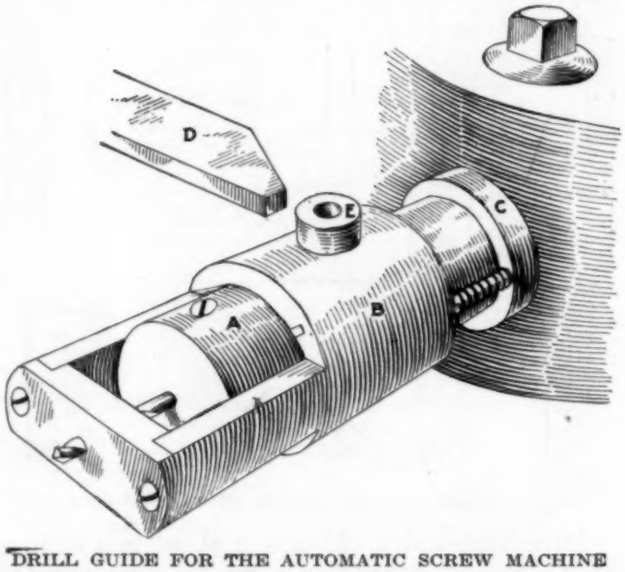
A Guide for Small Drills in an Automatic Screw Machine

By Donald A. Hampson

We had converted a small hand-screw machine into an automatic to do butts and heads and similar parts that did not require threading. The turret was locked in position and but one hole was used for tools, thus making a three-slide machine out of it. The arrangement was entirely successful, the machine doing fully as much work as any of the single-spindle machines and giving almost no trouble. But we ran into a lot of work that required small holes, $\frac{3}{32}$-in. and less to a depth of $\frac{3}{8}$ in., and we experienced considerable trouble in starting the drills centrally.

If the drill started wrong the piece was spoiled, even if the drill did not break, and it is difficult to start a drill truly, even on a flat end. Then when the cut-off tool got a little dull there would be a point left that was sure to throw the drill off. We could not seem to arrange a practical centering tool to precede the drill, but we did work out the drill guide shown in the cut, which has proved successful.

The regular drill holder is shown at *A*. It was provided with a key along which slides the sleeve *B* which



DRILL GUIDE FOR THE AUTOMATIC SCREW MACHINE

is cut away for chip room, oil splash and ease of setting up. At the outer end of this sleeve is a tool-steel piece, drilled in line with the hole in *A* and hardened, which supports the drill close up to the point when it starts. Two coil springs hold the sleeve in position. Collar *C* is merely a retainer for the springs.

As soon as the drill is started, the guide is unnecessary; in fact is in the way of the chips. A cam *D* is attached to the side of the rear slide, which is set to move up enough to move the sleeve back out of the way of the chips just after the point of the drill has entered. A roller *E* facilitates the movement. Different plates are used to guide different-sized drills and the trouble with eccentric holes has disappeared. The guide plate is fastened to the sleeve by means of two screws, these being easily and quickly removed and replaced when changing plates, which are positioned by a shoulder as illustrated.

Making Boring Bars for Big Guns

By M. E. HOAG

The boring of a true, straight hole 1¼-in. in diameter and 42 ft. long is an operation somewhat out of the ordinary. This article tells how it is regularly accomplished in the making of boring bars for big guns.

IT MUST be admitted that the boring of a 1¼-in. hole through the center of a Cumberland ground shaft 4½ in. in diameter and 42 ft. long is a rather formidable mechanical undertaking, but it is being done nearly every day at the Steinle shops at Madison, Wis., on a Steinle 24-in. turret lathe with a 6-in. hole through its spindle.

The method of supplying oil under pressure to the boring tools on big-gun work has been to mill a slot or spline down one side of the bar to hold an oil pipe which is soldered or otherwise fastened in place. This slot not only tended to weaken the bar, but by reason of the limited size of the slot that could be used, a stream of oil about ¼ in. in diameter was all that could be secured. A boring bar so equipped is shown in Fig. 1.

In order to increase the oil supply without weakening the boring bars Mr. Steinle decided to bore a 1¼-in. hole directly through the center of the bar. The end of a bar so bored and equipped with supply pipes is shown in Fig. 2.

A Steinle 24-in. turret lathe was equipped with a four-jawed chuck to hold the end of the bar, which was passed through the spindle and located centrally at the rear by four setscrews let into a ring on the outer end of the spindle. The overhanging length of the bar was lined up and supported by heavy roller rests, as shown in Fig. 3.

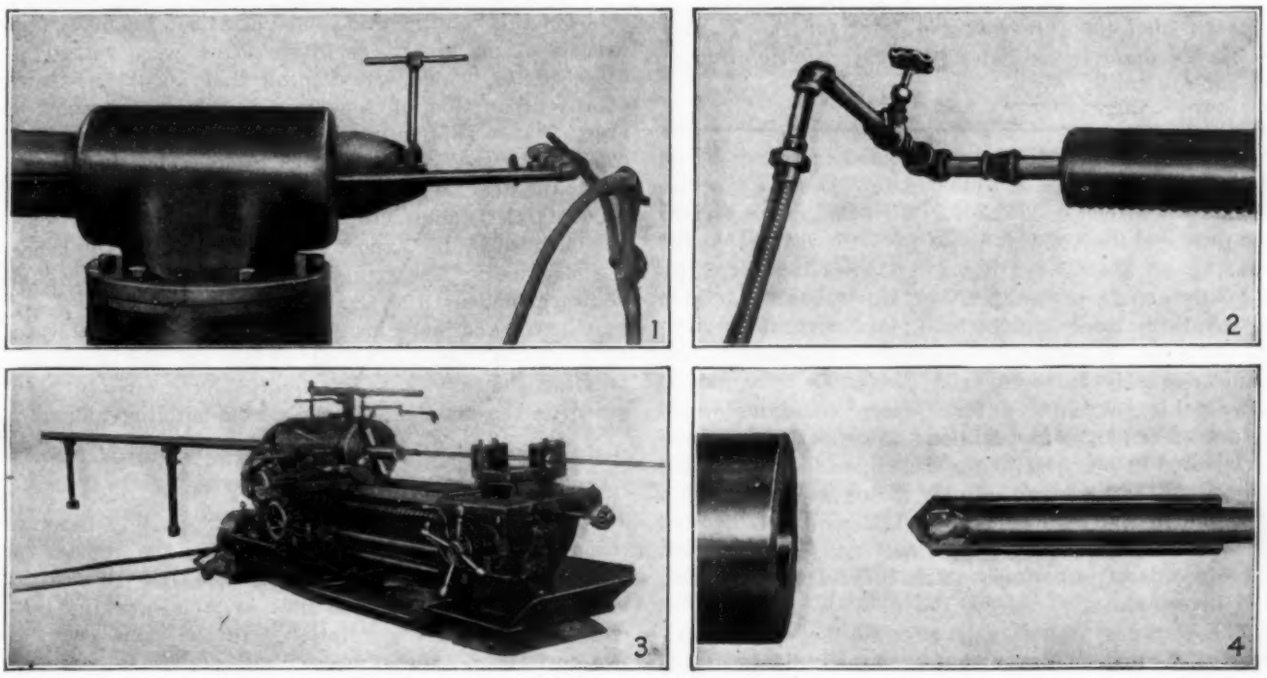
The turret was locked in position and two split bushings were made to hold the steel tubing which formed the shaft of the boring tool and also served to carry a liberal supply of oil under heavy pressure to the point of the tool.

A hole was drilled in the end of the shaft and then bored true and to size with a boring tool held in the cross-slide of the lathe. This gave a start for the cannon drill which was fastened to the end of the tubing. The cannon drill was backed with brass and one side partly cut out to allow the oil and chips to escape, a high-speed steel bit being inserted in the end as shown in Fig. 4, which shows the end of the boring bar and the cannon drill in position.

After the hole was drilled clear through the shaft the boring tool in the cross-carriage was again brought into use and the end of the bar taper-bored to receive the boring tool to be used in boring the guns. Slots for a drift were also put in to facilitate removal of the tool.

Reference to Fig. 2 will show that the boring bar has a rack cut in its under side. This extends almost its entire length and the cutting was done with a milling machine equipped with a vertical attachment carrying two gear cutters properly spaced for pitch.

The heavy cast-iron supports were bored to receive the bar, split at the top and equipped with screws to clamp the bar firmly in position. The under side



FIGS. 1 TO 4. DRILLING HOLE THROUGH CENTER OF LARGE BORING BAR

Fig. 1—Usual method of supplying oil to boring bar. Fig. 2—1¼-in. oil supply through center of bar. **Fig. 3—Set-up of lathe** for boring oil passage. Fig. 4—Close view of work and tool

of the supports were ribbed to fit the table slots, the ribs insuring alignment of the shaft when the supports were bolted to the milling-machine table.

The bar was then placed in the machine and the outer end supported by tackle rigged to trestles about fifteen feet high so that the ropes had plenty of swing and the advance of the bar through the machine would cause no appreciable rise at the outer end which would be the case if short tackle was used.

When the rack had been cut to the full capacity of the machine table the clamps were loosened, the table run back along the bar and a new location secured by running the milling cutters into the last two cuts taken. The clamps were then tightened, the tackle readjusted on the bar and the operation continued. In this way a long and difficult piece of work was handled on small machines with creditable speed and satisfactory results.

Foreign Commerce and the Machinery Industry

By L. W. SCHMIDT

The growth of American machinery exportation in three years from $115,658,814 to $262,241,278 shows the tremendous stride that has been taken by this industry, and when it is realized that of this total the share of the machine-tool division alone amounts to $84,935,410 it can be readily seen what the future has in store for it. This review dissects and details the expansion of this foreign trade.

IN 1914 the United States exported machines of all descriptions valued at $115,658,814. In 1917 exportation had grown to $262,241,278. Machine tools formed the principal item of this trade for both years, that for 1917 being $84,935,410 against $14,841,380 for 1914. A yearly export of machinery of over a quarter million of dollars naturally cannot take place without exerting its influence on national machinery production. If it would suddenly cease to exist thousands of workmen now making machinery for foreign countries would be out of employment. Millions of dollars of raw material used in manufacturing these machines would not be needed, and correspondingly there would be a big decrease in the earning power of the capital invested in the American machinery industry. This export, therefore, is of importance to manufacturers, workmen and investors.

The war has very largely affected the export business of the principal groups of machine builders in this country and an inquiry into the result of the great changes that have taken place in this business should be of special importance. We should know, for instance, how many men every industry requires to keep up production large enough to secure the urgent demand of the home market; how many men will be wanted to fill the growing needs of the export business; what capital enlargements may be necessary to allow for additional equipment, and what can be saved without danger to the national household.

The questions involved in such an inquiry are complex. The product of the machinery industry is not one of even price. It does not sell by weight, but by an ever-changing unit, the price of which is not regulated by volume but rather by the work going into its manufacture and by the utility of the machine. Consequently it is almost impossible to establish standards for production and price as can be done in many other industries, and the result of such an attempt must remain approximative. This is especially the case as to the figures for 1917. During the year 1914 the industrial census took place, and the census figures allow at least a limited insight into the working of the machinery industry.

In 1914 the production of the foundries and machine shops of this country was valued at $1,373,309,000. The exports of machinery, as given above, were valued at $115,658,814, which would mean that about one-tenth of the production of American foundries is exported every year. This estimate, however, is much too low, considering that the industries grouped by the census under the general heading of foundry and machine-shop products also manufacture a great many other articles not included by the export statisticians under the heading machinery. The actual proportion, therefore, would be nearer one-sixth of the total production.

A better and more instructive result can be obtained by studying the individual groups of the machine-building industry. A few figures have already been given on the metal-working machine-building industry.

Nearly One-Third of American Machine-Tool Production Exported

The value of the production of that group of the machine-building industry was given by the census of 1914 as $49,084,734. Of this $31,446,660 related to machine tools; the rest to that of metal-working machines of different description. In the same year 30 per cent. of all the machine tools and metal-working machines made in the United States was exported. The importance of the export business can best be understood by showing that three years later $84,935,410 worth of machine tools, or $35,000,000 more than the total value of the machine-tool production of the country, was sent abroad. The influence of this enormous increase on the national machine-tool-building industry can only be estimated. Men closely connected with the industry, of course, have realized its expansion during the past few years. They know that many new firms have entered the field and that others have added to their production, doubling and even trebling that of a few years ago. If we take into consideration the fact that during the same period the demand in the United States for machine tools has also been very great it is not unlikely that the output of the machine-tool-building industry during 1917 has risen to nearly $160,000,000.

Taking $2400 as the approximate value of one man's product during 1914, which is a conservative figure, it would appear that 6183 men were employed in the machine-tool industry on export work alone during that year. Since then the price of labor and of the product has risen so today $3400 would seem to be a fair value of the product of one man estimated on the same basis as the figures used for 1914. Last year 24,981 men should have been required to turn out the enormous quantity of metal-working machines ordered in this country principally by our allies. No reliable figure, of course, can be obtained as to the proportion of exports to the total production, but probably 50 per cent. of last year's production of machine tools have gone abroad.

Influence of Exports on Raw-Material Markets

The influence of foreign trade on the machine-tool industry becomes still more evident if one considers the increase in the materials which have been needed to turn out the machine tools valued at over $84,000,000 shipped abroad during the last year.

In 1914 the machine-tool industry of this country spent some $20,000,000 for materials, $5,900,000 of which was needed to supply the wants of the export trade. At the same valuation the industry needed raw material valued at $31,900,000 to make the machine tools exported during 1917, which of course takes into consideration the considerably higher price of many of the materials employed in machine-tool making since the outbreak of the war.

The machine-tool industry, although the most important of the exporters of machinery, is not the one most vitally interested in the continuance of the export trade. It is different, however, with the sugar-mill machinery, as 91 per cent. of this product was exported during 1914. The export growth of this industry has been so phenomenal that it even overshadows the progress made by the machine-tool industry. In 1914 this branch of the machine trade sent abroad only $1,814,137, but in 1917 it grew to $11,026,767, or nearly six times the national production of three years previous. Instead of the 750 men that had to be employed to make the machinery exported during 1914 it required 3200 and the value of the necessary materials which in 1914 had been only $725,640 rose in 1917 to $4,400,000.

Another section of the machine-building industry which is vitally interested in export trade is that of the sewing machine, which delivered 39 per cent. of its production to foreign countries in 1914, valued at $8,658,762, the total production for that year being worth $21,710,643. The export trade of this industry has suffered by the war. Only $6,536,863 were paid by foreign countries for American sewing machines in 1917, reducing the men engaged in this division to 1900 in 1917 from 3600 in 1914. The material required by this industry was valued at $3,400,000 in 1914 and $2,600,000 in 1917, and its experiences since the outbreak of the war, therefore, were less gratifying.

Another member of the machine group which exports a large part of its output is the typewriter industry. In 1914 the value of this commodity was $20,516,532, and not less than $7,573,145 of this was manufactured for foreign consumption. This means that 36 per cent. of all the typewriters made here are disposed in other countries.

Since the outbreak of the European war the typewriter business of the world has undergone many changes. In America it suffered, at least during the first year of the war, a slump. In other countries, however, especially those at war, there has been an enormous increase in orders, with the result that during 1917 there were exported typewriters to the sum of $11,162,423. This increase apparently has not materially affected conditions in America. The few hundred men needed to handle the additional export business were most likely found by drawing on other departments of the industry, so that few actual changes have taken place in the employment. On the other hand the higher price of the materials used in making the export goods must have made necessary a larger outlay, which may have added $1,400,000 to the $3,000,000 paid in 1914.

As to mining machinery 32 per cent. was exported in 1914. The total production was valued at $23,823,117 and the exports at $7,216,446. Since the beginning of the war there has been an increased demand for American mining machinery, the exports rising to $12,046,318 in 1917. During 1914, 3000 men were needed to supply the export market and 3500 during 1917. The cost of the material used in making these machines rose from $2,880,000 to $4,800,000.

Other branches of the machinery industry which have increased their export trade are adding and calculating machines, air-compressing machines, cotton gins, cream separators, elevators, laundry power machinery, milling machinery, paper and pulp machinery, pumps and pumping machinery, refrigerators, shoe machinery and textile machinery. Of the adding and calculating machines manufactured in this country only 7 per cent. are exported; the exportation of air-compressing machines amounts to the same; 2 per cent. of the cotton gins made are for foreign account and 3 per cent. of the cream separators, 6 per cent. of the elevators and 5 per cent. of the laundry power machinery. The milling-machinery industry is interested somewhat in the foreign trade, as 17 per cent. of its production went broad in 1914, which is slightly less than the shoe machinery, which shipped 19 per cent. of its total production. Eight per cent. of the paper and pulp mill machines made were sent abroad during 1914, 10 per cent. of the pumps and pumping machinery and 5 per cent. of refrigerating machinery.

Increase in Export Values

The fact that export values increased does not mean that in every instance greater exertions were necessary to fill the demand from abroad. A slight expansion only in the export values of any particular machine may mean under the price conditions prevailing during the last years an actual decrease in the number of machines exported and, therefore, in turn also a decrease in production. Fewer workmen, for instance, were needed to handle the export orders of the cotton-gin and laundry power machines, notwithstanding the export values of both kinds of machines show increases. The same is true of milling and shoe machinery. Consumption of materials, of course, has been augmented very much in all those cases where increases in exportation have taken place. This is only natural, as the rises in the sale prices have been caused largely by corresponding rises in the cost of production.

While it would seem that the war has favored most of the machinery makers of this country, as far as export business is concerned, some have suffered slight reductions in the value of their export. Among those are the makers of brewery machinery, cash registers, lawn mowers, printing presses, typesetting machines, windmills, and the nonpower laundry-machine group. It is a peculiar fact that most of the industries that have experienced a falling off of their export business are those that depend largely on export trade for a considerable part of their annual takings. For instance, of the $15,935,069 worth of cash registers manufactured in 1914, $267,829, or 20 per cent., went abroad. In that year about 1300 men were employed in connection with its foreign trade, and the falling off in the export trade, therefore, must have affected its labor roll to a large degree. Only $1,501,384 worth of these appliances was exported in 1917.

The drop in the exports of nonpower laundry machinery was also much felt in that industry, as approximately 30 per cent. of its production every year goes abroad. During 1914 13 per cent. of all lawn mowers manufactured in this country were shipped abroad and 23 per cent. of all printing presses. The latter industry has seen only a small decrease in the value of its export during 1917 as compared with 1914. The effect on labor, however, seems to have been fairly great, owing to the very much increased cost of printing presses since the outbreak of the war, which makes the actual number of presses exported much smaller than can be deducted immediately from the small decrease in the value. The same observation applies to typesetting machines, which depend for a large part of its production, about 20 per cent., on foreign trade, and a reduction in foreign sales should make itself felt in its total production. During 1914 18 per cent. of all the windmills made in this country were exported.

The census subdivides the products of the woodworking-machine industry in sawmill and other machinery. The production of the first group is valued at $6,303,920 during 1914; that of the second at $7,088,980. During the same year 7 per cent. of the sawmill machinery manufactured was exported and 12 per cent. of the remaining woodworking machines. The influence of the war has decreased slightly the value of the sawmill machinery exported, but has added about $90,000 to that of the other woodworking machines sold abroad, with the result that this industry today employs less labor in the production of that part of its production made for foreign trade than before the war.

Result of Export Business

In 1914 564,610 men were employed in the foundry and machine shops of this country. Many of these men doubtless were employed in minor and repair work, and a great number of them were not actually building machinery of any sort. A careful estimate, however, shows that to build the machinery exported in 1914 at least 48,000 hands were required. About $35,000,000 were added in this way to the wage roll of the United States. The increase in the export of machinery since 1914 has necessitated an additional employment of labor, and at least 77,000 men must have found work by making the machinery valued at $262,241,000 exported during the year 1917. Estimating the wage increase in the industry at 50 per cent., the figure indicated by the New York State Department of Labor, this would mean that the export trade has been worth approximately $77,000,000 to the American workingmen employed in machine building. Manufacturing profit to the amount of $23,000,000 was added to the income of the American machine-building industry by exporting machinery in 1914 and $55,000,000 in 1917, while the industry spent about $45,000,000 for materials in 1914 and nearly $100,000,000 in 1917.

It is this point of materials needed for export manufacture which is never fully considered whenever the question of national export profit arises. Every industry that exports parts of its production also employs in turn other industries. To provide for the $100,000,000 worth of materials which was bought by the machine-building industry of this country to satisfy the needs of its foreign customers the whole national apparatus had to be set in motion with a profit resulting thereof to all those who had to be employed for the purpose.

Real-estate values are enhanced by this activity, builders have to be employed to construct the factories for making the machines to be exported, and the machine industry in turn receives orders for metal-working machines to make the machines, which finally are sold to our foreign customers.

To provide for the total production of the foundry and machine shops of this country, which was valued at $1,373,309,000 during the year 1914 a working capital of $1,846,349,000 was necessary. This would mean that some $150,000,000 of the capital employed during 1914 in the American machine shops has returned a profit in direct consequence of the export trade built up by this country, and that more than double that amount was turned into a profitable investment by the increasing foreign demand for machines during the year 1917.

These figures deserve the attention of all who have set their faith in the machine-building industry of the United States. They prove how large an influence is exerted by our foreign trade on the wellbeing of the industry, and they make it questionable whether the industry could work to its best advantage if it had failed to gain its excellent foreign connections.

Easy Rule for Approximating Tap-Drill Sizes

By J. D. Cox
President, Cleveland Twist Drill Co.

On page 748 of the *American Machinist* I noticed the article entitled "Easy Rule for Approximating Tap-Drill Sizes." I have had the following rule in my pocket memorandum book for a great many years, and I think it is easier to remember and easier to work out than the one suggested by Mr. Jason: Deduct one and a half times the pitch from the outside diameter of the tap. The result is the diameter of the drill for such tap.

Taking the same illustration used by Mr. Jason, for example, a $\frac{3}{8}$-in. tap, 16-pitch thread, it works out as follows: One and a half times $\frac{1}{16} = \frac{3}{32}$, and $\frac{3}{8} - \frac{3}{32} = \frac{9}{32}$, therefore the diameter of the tap drill should be $\frac{9}{32}$ inch.

Intrenchments and the Wire Barrier

By H. H. MANCHESTER

The remarkably effective use of barbed wire with intrenchments in the late war lends especial interest to the evolution both of intrenchments and barbed wire.

THE use of barbed wire leads one to inquire what was done in the way of intrenching in previous wars and what was employed as obstacles before it was invented. In this connection a distinction must be made between permanent fortifications and field works. Permanent fortifications, of course, go back to prehistoric times, and have been used by almost all nations, but the field works constructed in early times were comparatively few. Walled cities, mounds and moats were built by the ancient Egyptians, but there is no evidence that they intrenched their camps. The walls of Babylon and of other cities of Mesopotamia are likewise famous, but neither the Babylonians nor the Assyrians seem to have intrenched their battle lines. The walls of Troy are again and again referred to by Homer, but he says nothing about intrenchments outside. The Spartans disdained to build walls even around their cities, proudly claiming that each individual soldier was a brick superior to that in any defensive works that could be devised.

FIG. 2. A MEDIEVAL BARRIER OF WAGONS AND STAKES

The Romans, however, inaugurated the practice of fortifying very strongly any camp which was expected to be at all permanent. A good idea of such field works at their best may be gathered from Cæsar's description of how he fortified his camp when he was besieging Vercingetorix at Alesia. Cæsar was fearful of aid being sent to Vercingetorix from without, and therefore constructed two lines of works around the town, with his army placed between them. His inner line of intrenchments consisted of three parallel ditches from 15 to 20 ft. broad and deep. One of these was filled with water, and behind them was a rampart 12 ft. high.

Along the foot of the parapet Cæsar placed a fraise consisting of long stakes, the branches of which were cut into points so that they had the appearance of stag's horns. It is evident that this was an obstacle analogous to those employed today. As part of his lines he also dug shallow trenches and pits at the bottom of which were fixed sharp-pointed stakes. The front of the whole line he sowed with many crows' feet, or caltrops. These were pointed stars which, no matter how they rested on the ground, would always present one or more points to the enemy.

Cæsar constructed similar lines of works around the outside of his army, and by means of them defeated great relieving forces, who, he specifically says, were entangled among the caltrops and pits.

Toward the end of the Roman Empire the Roman military system became broken up, the legions lost their efficiency and more dependence was placed by barbarians and Romans upon cavalry. While a great deal of attention continued to be paid to walls and other permanent fortifications, intrenchments of camps after the Roman method passed out of use. Sometimes the barbarians arranged their wagons in a circle around the camp, Fig. 2, and occasionally with upright stakes. But in general during the Dark Ages, there were few intrenchments of the line of battle. After the development of armor and the knight, during the Crusades, the cavalry became of still greater importance in comparison with the foot soldier. To impede a charge of the knights, the caltrop was further developed, and the Spanish reiter was invented. This consisted of a number of sharpened stakes several feet long bound together, Fig. 3, on the principle of a crow's foot, but high enough to impede the cavalry. It is doubtful whether even these were much used.

The invention of gunpowder hardly changed the problem of intrenching the line of battle. It required so much time to load the early guns that it was difficult to construct obstacles that would hold back a charge long enough to permit a second volley and not be at the same time a protection for the assailants. Possibly the best device was the abatis which was constructed by felling trees with their branches toward the enemy.

In early modern times great reliance continued to be placed upon strong forts, and sometimes critical points in a line of battle were fortified with field works

which were really redoubts or miniature forts, but no such obstacles as at present were employed.

In the Seven Years' War infantry became more mobile and more capable of flanking a position, so that even redoubts on a battle line were dispensed with. The same rule held good in the Napoleonic Wars, in which any plan of intrenching a whole position seems never to have been carried out.

Increase of Range

The invention of the rifle increased the range of accurate fire from 100 to 600 yd. This gave an opportunity, even with the muzzle loader, of two or more volleys during a charge, and increased the desirability of protecting one's own troops and impeding the enemy. The idea of protection was applied in a few rifle pits in the Crimean War, but the first regular employment of modern intrenchments came in the War of Secession. The military history of this conflict shows the gradual recognition of intrenching. Grant, for example, was not intrenched at Shiloh, and came near losing the battle. Thomas' intrenchments at Chickamauga enabled him to hold fast after the rest of the Union Army was driven back. Lee was not intrenched at Antietam, but was at Fredericksburg, and throughout the whole campaign from the Wilderness to Five Forks.

At first the ditches were dug in front of the breastworks like an ancient moat, but later the breastworks were thrown up in front of the trench as in the present war. In wooded districts an abatis was often constructed, and the armies eventually learned to make intrenchments whenever they were in the presence of the enemy.

First Employment of Wire

In all the centuries, from the earliest records to the War of Secession, we find no mention of the military use of wire as a barrier. Its first employment for this purpose seems to have been made at Charleston in 1863, when the defenders strung wire in front of their works to stop a charge. What is more remarkable, they hung bits of broken glass, sharp stones, nails and other pointed materials on the wire in such a way as to form crude barbs. This may be considered the first use of barbed wire.

Why military authorities were so slow to adopt wire as a barrier is a question, the answer to which probably lies in the difficulty in early times of manufacturing wire in quantities. In fact the development of wire manufacture is a story in itself.

Gold wire, which was used in jewelry, has been discovered among the relics of the first dynasty in Egypt.

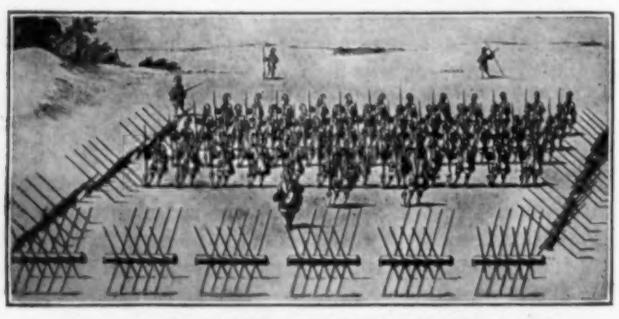


FIG. 3. A BARRIER AGAINST CAVALRY (1600)

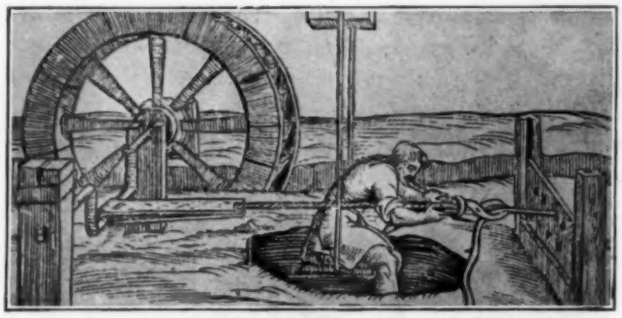


FIG. 4. WIRE DRAWING BY WATER POWER (1540)

This means that it was made some 6000 years ago, and how much earlier we do not know. At that time it was pounded out by hand by the metal worker. His hammer was merely an oblong rounded stone, and his anvil only a flat rock. The process was so laborious and expensive that for several thousand years wire was used almost exclusively in jewelry.

In early Greek times wire seems to have been employed to some extent for nets, for in the Odyssey Vulcan is described as making an almost invisible wire mesh with which to entangle Venus and Mars.

By this time the steel, or at least iron, hammer with a handle had been invented, and the anvil with its block had come into use.

In the Roman era wire was occasionally even made up into rope, a specimen of which consisting of 15 bronze strands has been discovered at Pompeii. But in classical times nothing seems to have been developed in the way of wire fences or barriers, probably, as already suggested, because of the tedious and costly process of forging the wire. In those days, the method seems to have been to hammer the metal into sheets, cut up the sheets into strips, and round the strips on the anvil.

Discovery of Drawing Process

How early it was discovered that wire could be drawn, instead of forged, is uncertain. It must have been some time in the Dark Ages, for about 1100 A.D. Theophilus mentioned wire drawing as a process already in practical use.

There is a medieval picture purporting to show the interior of the goldsmith shop of St. Eligius of the seventh century, but the picture is probably not as early as the statement of Theophilus. The scene nevertheless gives a good idea of the first method used for drawing wire. This was to have a steel plate with holes of various sizes, to forge the end of the wire to be drawn small enough to be started through one of the holes, and to pull the rest through by main strength with the help of only a pair of pincers. The wire was thus drawn through one hole after another until it was reduced to the desired size. Iron wire was probably softened by heating between the different operations.

It was long claimed that wire drawing was discovered by Rudolph of Nuernberg about 1400, but at most this could have been merely an improvement over the process already known.

A painting of 1389 illustrates another method of wire drawing. In this two spools are employed, and the wire is merely stretched from one to another without passing through a draw plate. Another painting of

FIG. 5. A WIRE FACTORY (1717)

1418 shows the use of the pincers and draw plate with only one spool. By this time the drawing of wire had become very important, as it was used in the making of rings for the chain armor of the period.

Leonardo da Vinci gave considerable attention to wire drawing, and left a number of sketches dating from before 1500, suggesting devices for that purpose. They were to be worked by hand power through the medium of an endless screw or toothed wheels.

The most important method for obtaining power in the Middle Ages was through the water-wheel. The earliest evidence of the application of this to relieve the labor of wire drawing seems to be in a water color by Dürer which dates from 1497.

A painting of 1527 indicates that the approved method used in the wire-drawers' guild was to draw the wire from one spool to another through a steel plate.

Wire continued to be important from a military point of view because long used for ring armor, though not employed for barriers or entanglements. In 1540 Biringucci, who considered things from the viewpoint of war, took up the subject in his "Pyrotechnia" and illustrated several devices for wire drawing. One, Fig. 4, gives a very good idea of the application of water power. Another illustrates three methods of drawing wire by hand. In one of these two spools are used, while the others show the use of pincers and cranks.

Wire Drawing by Guild Workers

Among the wood cuts by Jost Amman on industrial subjects several illustrate wire drawing, but these show merely the simpler methods employed by the ordinary guild worker.

At the end of the next century, 1699, Weigel gave what he considered a typical illustration of a wire-drawer's shop. Considerable change may be noted in the pincers. The power is not shown, and seems to be below the floor. From this it may be water power or more probably a treadmill. In the front of the picture is visible a cone-shaped frame on which the coil of wire could be arranged.

Several very fine engravings in regard to wire drawing were first prepared in 1717 and reproduced in the French Encyclopedie in 1765. One illustrates the old method of drawing wire between two spools, Fig. 5, and shows also the arrangements of the furnace by which the wire could be softened, when necessary, between two drawings. In this case the draw plate shows a number of different holes, indicating that this method was used for fine wire.

Another of these cuts portrays hand operations, but with improved devices for the application of hand power. One of these is in the form of a lever, while the other is a drum which is being revolved by two workmen.

The third picture, Fig. 6, of this series illustrates the interior of what then passed for a large wire mill. At the right is the furnace and a smith pointing the end of the wire much as it was forged centuries before. The center of the picture shows a shaft which was worked by water power. Arms on the shaft bore down the levers, the other end of which was fastened to the pincers which drew the wire. When a lever was released, the pincers were again advanced to take a new grip on the strand. The work of the attendants seems to have been principally that of winding the wire.

Fencing, or plain wire, began to be experimented with in the 18th century after the application of water power made possible its production in a comparatively large way, and it was found suitable for many purposes. After the opening of the Western United States, about 150,000 miles of plain wire was put up there before 1850, though it was not particularly effective for cattle or horses.

Barbed Wire at Charlestown

How barbed wire was used at Charleston in 1863 has already been mentioned, but it was 10 years before the first crude attempts to manufacture it were made by Hunt. In his wire the barbs were sometimes jagged rings, and sometimes spurs slipped over the wire. Kelly improved on this idea by the use of sheet-metal spurs, but modern barbed wire may be said to date from Glidden, who inserted twisted wire barbs between strands of twisted wire. A machine for making barbed wire was constructed in 1878. Within four years after barbed wire was put on the market about 15,000 tons of it were sold.

In the Spanish-American and Philippine wars, it was found that closely strung wire fences did much to hold up a charge, while not offering any protection to the assailants. The value of these qualifications was multiplied by the use of the repeating rifle which made it possible for a number of volleys to be delivered while the charge was being delayed.

As soon as the armies dug in during the present war it was discovered that barbed wire made an almost ideal entanglement, and it was not long before it was being used in almost every conceivable form for that purpose.

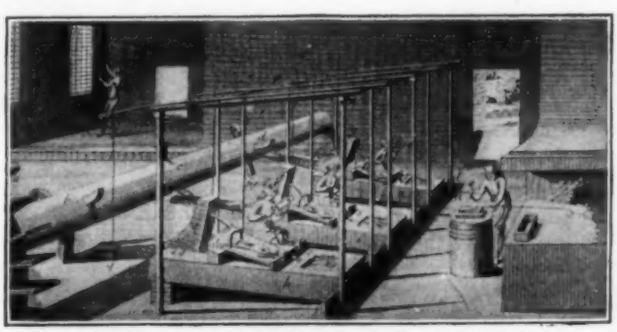


FIG. 6. A WIRE FACTORY DRIVEN BY WATER POWER (1717)

International Trademarks: The Present and the Future*

By LAWRENCE LANGNER
Member of the Patents and Trademarks Committee of the American Manufacturers' Export Association

THE enormous expansion in our export trade during the past few years has brought us into contact with some difficult problems, many of which are yet unsolved. The problem with which I am going to deal in this paper is that of international trademarks, a problem to which a satisfactory solution has not yet been found.

The dangers to which an exporter is exposed if he does not register his trademark in foreign countries are now generally recognized in this country. Only recently our Department of Commerce issued a report to the effect that the registration of trademarks in foreign countries may be regarded as one of the fundamental steps of preparation for trade after the war; that foreign trademark registration is perhaps of even greater importance now than under normal conditions, in view of the reported activity of enemy agents and others in appropriating American trademarks; and that any article worth advertising abroad is worth protecting by means of trademark registration.

In particular the Department of Commerce has drawn the attention of exporters to the countries of Latin America having furnished a particularly profitable field for the registration of trademarks for speculative purposes, as most of those countries grant the exclusive right to use a mark to the first applicant without regard to its prior use by another, and that nearly every issue of the official bulletins of some Latin-American countries contains applications for trademark registration that are fraudulent or at least unauthorized.

The Government has stated that the names of automobiles, motor trucks, pharmaceutical preparations and other articles, the sale of which depends largely upon advertising and good-will, have been particularly subject to misappropriation, and that recently a single firm applied for the unauthorized registration of the trademarks of six of the best known American cars. And yet, gentlemen, in spite of this warning, which I believe has been spread about the country by the Department of Commerce and with which you are probably all familiar, our Government has not yet taken such drastic steps as we have the right to expect should be taken in order to remove a condition which is so obviously unfair to the development of American export trade.

I understand that the International High Commission and State Department are now making a special investigation of the international trademark situation with a view to ascertaining what remedy, if any, is possible to alleviate these unfair conditions, and I am hoping that the opinion expressed by this association in regard to this question will be of assistance to our Government in forming its plans for the protection of our trademarks against unauthorized appropriation.

I think it is apparent to all of us that we are at the door of a new era in export conditions. The export trade of the United States—the development of the last five years—is going to be put to the test. For this reason I do not think my paper would be appropriate were it to deal only with the situation as we find it at present. In these times all of us have to venture on prophecy, and for this reason I shall deal first with the situation as it is today, and I will then endeavor to outline those policies which, if followed by our Government in the wonderful opportunities for international coöperation which will be afforded at the close of hostilities, will procure fairer dealings for our traders in foreign countries.

As a result of considerable experience in specializing in international trademark law and the protection of trademarks in foreign countries I can testify that the United States Department of Commerce has not exaggerated when it states that the apparent increase in the number of unauthorized applications for the registration of American trademarks abroad calls for an emphatic reminder to American traders. It calls for more than a reminder, it calls for action. It is not a monthly occurrence in my office, but almost a weekly one, to be advised that the well-known mark of an American trader has been appropriated by some party in a Latin-American country, and that an application for registration has been filed and is about to be registered. Under such circumstances, at the eleventh hour, the American trader endeavors to assert his rights, but in most instances he is too late, and he has no legal grounds upon which to oppose sucessfully the registration of his trademark by the pirate.

Prevalence of Appropriation

So prevalent has this appropriation of trademarks become in the Argentine Republic that attorneys who make a practice of representing domestic concerns in Argentina, such as firms of importers, have actually evolved an ethical reason for appropriating the trademarks of American manufacturers. The reason is that if the Argentinian concern representing the American concern does not steal the trademark it will be stolen by someone else. These ethics are preposterous from the standpoint of the American manufacturer, and yet from the standpoint of the Argentinian importer it is better for the American to have his mark stolen by a friend than by some less disinterested party.

Experience has shown that when these "friends" have been requested to assign the Argentine marks to the American concern excuses are made which lead us to believe that, after all, our Argentinian friends wished to have a hold on us which would forever preclude us from dealing with any other concern in Argentina in goods bearing the trademark in question. Under these circumstances, unfair as the expense seems to be in the case where the possibility of doing business has not been tested out, it appears to be necessary to lay down the rule that no dealings should be had with parties in the Latin-American countries

until the trademark application has actually been filed in the Trademarks Office. Any exporter who fails to take this precaution cannot complain that he has not been adequately warned.

For the past two years a great deal has been written on this subject and circulated throughout the country, and even the most conservative of our manufacturers, who have thought that where ignorance is bliss it is folly to be wise, have awakened to the realization that their ignorance and blissfulness has cost them their trademark rights in countries where they might otherwise have built up a successful business.

Nor does the loss of a trademark, pirated in this way in a country such as Argentina, extend only to the country in which it is pirated. A great many of the advertising periodicals are circulated throughout all of the countries of Latin America, and it is not an easy matter to use one trademark in business in one Latin-American country and an entirely different trademark in another Latin-American country, since it precludes advertising the articles by a single advertisement in the international periodicals.

Moreover it is not usually convenient for manufacturers in this country to use different labels and trademarks on the different goods according as they are shipped to one country or another, as confusion inevitably results from this course. In many instances the trademark itself is actually cast on the goods in the process of manufacture, and in one case I remember that where a mark had been appropriated in Cuba, in connection with a well-known cash register, it became necessary to make special plates for such cash registers as were manufactured in this country and shipped to Cuba.

These are merely inconveniences, serious enough, and after all it is possible to overcome them, but the loss of the good-will in a valuable trademark upon which millions of dollars may have been spent in international advertising is a far more serious consideration, and no amount of inconvenience will compensate for this loss.

Trademarks Really Insurance

Many manufacturers know that industrial property, such as trademarks and patents, represent the insurance policy on the good-will of their business. The fees that are paid for trademark registrations represent the premiums paid on the insurance policy. Just as no up-to-date machinery manufacturer can afford to be without a development department, unless he is willing to be outstripped by his competitors, and must therefore install such a department and protect the inventions developed by him under the patent laws of this and other countries, thereby insuring the capital invested in his business, so by registering trademarks in the various foreign countries, the exporter insures the good-will of his business and the money and effort which he has spent in advertising his goods and developing his trade in those countries.

I have made an estimate of the costs in annual payments of insuring the good-will of an export business, no matter whether it be great or small, whether it be a corporation of $100,000 or one of $10,000,000, and I find that the average costs per annum of insurance by trademark registrations in the Latin-American countries amounts to less than $5 a country per annum. No doubt all of you have seen in the prospectuses of corporations items such as "good-will and trademarks" estimated at many millions of dollars. Taking the figure of $5 per annum a country as the cost of insurance of the good-will of a business it does not seem to me that this cost is inordinately high as compared with the cost of insurance of other forms of property which are not nearly so liable to be stolen or appropriated as are trademarks.

This raises the practical question that while the cost of registration may not be too expensive for a concern which uses only one mark, yet a concern using many different brands might find this premium excessively high. I have time and time again advised manufacturers and exporters in this country that the greater the number of trademarks they employ in marking their goods, the less protection they secure in the foreign market. It is far better to concentrate on one distinctive trademark for all goods made by the same concern and to do away with the use of brand marks by utilizing numbers in their place than it is to endeavor to protect a good-will throughout the world by registering a number of entirely different brand marks. This is obvious, expressed as a business proposition and outside of the legal question.

Many exporters are not fully familiar with the reason why it is that piracy is so prevalent under the laws of the Latin-American countries. I venture to say that were one to accuse Latin Americans of fostering a consistently dishonest trademark system to encourage the stealing of foreign marks he would be met with the indignant retort that such a statement was absolutely untrue. And the Latin American would be correct. Yet it is unfortunate that the laws of many of these countries lend themselves to piracy, mainly because they are based on a conception of trademarks as property which is entirely different to ours.

Difference in Laws

In the United States the exclusive right of the owner to the trademark is acquired by the use of the trademark by the owner. In the South American countries and most European countries ownership in the trademark is acquired by going to the Government Trademarks Office, filing an application, paying a Government fee and receiving a certificate of registration. This certificate of registration is granted irrespective of whether the mark has been used by the person claiming to be the owner, or whether it has been used by any other person, or whether the person attempting to register it has stolen it from another.

There are therefore two fundamentally different types of trademark property, one acquired by use, such as in this country, and the other by registration, such as in the Central and South America. Under the laws of these countries the American who does not register his trademark is not the legal owner thereof no matter how much he has used it, and the person who registers the trademark becomes the legal owner of the trademark. There are some exceptions to this rule. Some of the South American and Central American countries are parties to the International Convention of 1883, under article 8 of which a commercial name is protected in all the countries which are parties to the

convention without the obligation of registration, whether it forms part of an industrial or commercial trademark or not. This union, to which the United States is a signatory, includes Belgium, Brazil, Spain, France with Algiers and the colonies, Great Britain, Italy, the Netherlands, Portugal with the Azores and Madeira, Serbia, Switzerland, Tunis, Norway, Sweden, the Duth Indies, Surinam, Curaçao, Santo Domingo, New Zealand, Australia, Denmark, Japan, Germany, Mexico, Cuba, Australia, Austria, Ceylon, Hungary, Trinidad, Salvador and Guatemala.

Where the trademark forms part of the title or name of the company in one of the countries of the International Convention it is protected without the formality of registration in all the other countries, and in a number of cases where a concern in one of these countries has attempted to register the name of an American concern I have successfully opposed such registration and recovered the mark for the American concern. It is in such unions of countries, banded together to eliminate unfairness in international trade, that, as I will show later, lies the hope of a satisfactory solution of the international trademark question.

Laws of Other Countries

The unauthorized appropriation of trademarks is not limited to Latin America. The laws of practically every country in the world, outside the United States, permit the registration of marks that have not actually been used by the owner. In Great Britain and her colonies a registered trademark is not only a mark that has been used in the business of the owner, but also a mark intended to be used in the business of the owner, and it is quite possible under the British law to file trademark applications covering trademarks that are merely intended to be used, but in actual practice have not been used. I have run across instances where concerns in Great Britain have registered the marks of American corporations, but since the American corporation was the first user in Great Britain I have been successful in preventing the entry of such marks from the British Trademarks Register. On the other hand had the period for filing opposition expired it would have been a very expensive proceeding for the American concern to obtain possession of its trademark, even though it would be regarded as the legal owner of the trademark under the British law, for the reason that in order to rectify the British Trademarks Register it is necessary to bring an action in court, which is always costly.

It is not known to many exporters that in Austria, Bulgaria, Cuba, Denmark, Finland, Germany, Greece, Guatemala, Haiti, Honduras, Hungary, Norway, Panama, Portugal, Russia, Serbia, Spain, Sweden, Switzerland and other countries it is impossible for an American exporter to register his trademark unless he has already registered it in the United States Patent Office. Registration of a trademark in the United States Patent Office is the door through which we must pass in order to register our trademark in the countries I have just mentioned. One of the reasons why many of us are unable to register our trademarks in such foreign countries is because that door is closed to us.

Someone has remarked that the function of the United States Patent Office is to prevent the registration of trademarks. It cannot be said that its practice is in entire alignment with the domestic business interests of this country, nor does it in any way assist us in our international trademark difficulties. This cannot be blamed upon the Patent Office. The Patent Office is merely an instrument to carry out the laws of this country, and is itself hampered in adopting a broad-minded attitude by the Supreme Court of the District of Columbia, a body which seems to be completely out of touch with the commercial activities of this country, and yet is in a position to review the practice of the Patent Office and to impose conditions for the registration of marks which make it almost impossible to secure the registration of certain popular types of trademarks in this country.

Mutilating of Marks

In particular I refer to the practice of mutilating marks, which now forms a new way to prevent the proper registration of trademarks in this country as a result of a recent decision of the Supreme Court of the District of Columbia. Under the practice resulting from this decision every part of the mark which is not the exclusive property of the owner, whether it be his name, or a picture, or some kind of device for which he does not attempt to claim exclusive monopoly, must be removed from the drawing, so that the owner of the trademark ultimately succeeds in securing the registration not of his trademark but of parts of it. He then has to register these parts in the various foreign countries, and to rely upon these parts for the protection of his good-will.

In my opinion, one of the most important questions before this convention is the bringing of our domestic trademark situation into line with our export needs so that our system will not hamper us from securing trademark protection abroad. The fact that the larger proportion of trademarks used in this country are not registered in Washington is a clear indication that registration in Washington is a luxury rather than a necessity. It is an expensive luxury so far as the inability to secure such registration prevents us from securing trademark registration in many foreign countries. In Cuba American traders are absolutely debarred from securing Cuban trademark protection whenever the trademark does not fit in with the minute requirements of Washington, and our domestic regulations will prevent many from obtaining the full benefits of the Pan-American Trademarks Union when this union comes into operation for reasons which I will now explain.

Pan-American Union

Under the Pan-American Union, which includes Costa Rica, Cuba, the Dominican Republic, Guatemala, Honduras, Nicaragua and Panama, there is to be established a central trademark-registration office in Havana, Cuba, and it is intended that by filing an application with this office, proving that the mark has been registered in one of the countries, it shall be considered as registered in the other countries, subject to the laws of said countries and the rights of third parties. Before this union can come into full effect the laws of this country will have to be changed, as also the laws of certain other countries, so that the union is not yet

operating to the advantage of the American trader abroad, nor does the convention seem to have been drawn in such a way that the protection to be obtained is absolutely clear.

Article 2, the most important article of the covenant, reads as follows: "Any mark duly registered in one of the signatory states shall be considered as registered also in the other states of the union, without prejudice to the rights of third persons and to the provisions of the laws of each state governing the same."

An Ambiguous Point

The ambiguous point of this section is that relating to the rights of third parties and the laws of each state governing the same. Each country is free to interpret this section any way it pleases, and until some kind of interpretation of the covenant is had in the respective countries it is impossible to tell whether or not the protection afforded by union registration will be sufficient to protect American traders in the countries in question.

There is a tendency in certain Central American countries to regard registration in the international office at Havana as providing the basis for registration in the particular country in which protection is required, inasmuch as the Trademarks Office of said country can exist only by the payment of trademark fees. In order to give full force and effect to union registration in this country it is necessary to have a special law passed, and I understand that the Department of Commerce in conjunction with the United States Patent Office is now at work drafting such a law. We believe that the passing of this law should be expedited, so that the benefits of the union, whatever they may be, can be secured for this country with as little delay as possible.

While the Pan-American covenant permits of various interpretations it is clear that whatever the rights may be which are granted to American traders under the same they can be obtained only if the American trader is able to register his trademark in the United States Patent Office. Here again the United States Patent Office is the door through which we must pass before we can secure the benefits of this union when it comes into full force and effect.

Changing Laws

I have sometimes thought that the question we are confronted with today is whether we shall change our own laws or attempt to change the laws of the rest of the world. I believe that it is the expressed opinion of our Committee on Foreign Patents and Trademarks that our laws should be changed, not only in order to give full effect to the Pan-American Union but also to permit the registration of well-known trademarks in this country which do not measure up to the standards and conditions now prescribed by the United States Patent Office, so that any trademark which has been well established in commerce in this country can be registered. When the present trademark law came into effect in 1905 it contained a clause that any mark that had been used in commerce for 10 years prior to that date could be registered in the United States Patent Office. Many such marks have been registered under the provisions of this clause, known as the 10-year clause, and so far as I am aware it has never caused the slightest amount of inconvenience. Perhaps an immediate step to alleviate our difficulties would be the extension of this 10-year clause so that any mark which had been in use in this country for a certain period before the filing of the mark could be registered at Washington without having to measure up with the minute and detailed requirements of the Patent Office.

In this connection we must remember the registration of a trademark in Washington gives no ownership whatsoever in the mark, and that if anyone should endeavor to register a trademark in Washington which belonged to some other person that person can oppose the registration. Moreover if the person who registered the mark without having the right to do so attempted to bring suit against the one who owns the mark, and had continuously used it, the suit would fail. This is why the extension of registration facilities in this country would entail no commercial hardship in the domestic market, while greatly assisting us in the foreign field.

Foreign Trademarks

We must also bear in mind that we always require a foreigner who tries to register his mark in this country to produce a certificate showing that his mark has been registered in his own country. This is often unfair to the foreigner, because British merchants often fail to register their trademarks in the British Patent Office for the same reason that Americans do not register their trademarks in Washington, namely, because the value of such trademark registration is limited so far as the British field is concerned. When the Britisher tries to register his trademark in this country under such circumstances he is unable to do so. Nor must it be assumed that our own laws are such that piracy cannot be committed. I know of a case where a well-known trademark used on the continent was stolen by an American concern which simply proceeded to use the trademark in this country before the foreign concern established connections over here, thus obtaining possession of the mark and registering it. Under the laws of this country such an act is not only possible, but is legal, so long as there is no fraud.

If our own trademark laws are not amended to permit of easier registration we should surely make reciprocal arrangements, by treaties or otherwise, with countries such as Cuba, to enable us to register our trademarks without showing that the mark has been registered in the United States Patent Office. It ought to be sufficient, in my opinion, for any American trader who can produce evidence to show that he has a manufacturing establishment in the United States, and has used his trademark in this country, to register his trademark in any foreign country without having to show that the mark has been registered in the United States Patent Office. If the State Department is actively interesting itself in endeavoring to eliminate piracy in trademarks, this question is one of great importance and should be given consideration without delay.

It is also urgent for the development of our export trade, and in order to give full effect to the Webb Act permitting the combination of concerns in this

country for export trade, and to assist concerns that are handling a number of different classes of merchandise, to permit them to register their trademark in this country by a single registration in the United States Patent Office covering all kinds of goods, as is possible under the Canadian law. This would enable such concerns to secure registration in a number of foreign countries by the filing of a single trademark application and the payment of a single fee in each country, instead of as at the present time being required to file as many applications as there are applications in the United States Patent Office.

The United States trademarks practice requires the naming of the goods registered, and the registration is strictly limited to the goods on which the mark has been used. As a result it is often impossible to cover a number of goods of the same class by one certificate of registration, especially if the manufacturer in this country keeps adding to his line of goods as his business develops. Under such circumstances he has to keep multiplying his trademark registrations in the United States Office, often necessitating multiplying the registrations in the various foreign countries. In most foreign countries, a trader is permitted to register his trademark in an entire class of goods, even though he may only be using it on certain of the goods. The rule of the United States Patent Office calling for the multiplying of registrations also impedes the registration of trademarks in foreign countries, particularly in connection with the trademarks of associations for export trade, where a large number of different classes of goods are involved.

The British law also provides for the registration of association trademarks, where a number of manufacturers form an association employing a common mark, and an amendment of our law permitting such registrations in this country would be of value both to the domestic and to the foreign situations.

The Union of Berne

One of the matters requiring the attention of this Government is that of removing from the Register of Trademarks maintained under the provisions of the Union of Berne, of Apr. 14, 1891, providing for international trademark registration in Berne, Switzerland, those marks which have been registered by enemies and which are the well-known property of American citizens or corporations. An Austrian secured by union registration the marks "Federal," "Firestone," "Empire," "Vitalic," "Republic" and "Firestone" in respect of automobile tires, thereby obtaining international protection in Belgium, Spain, France, Switzerland, Tunis, Holland, Portugal, Italy and Brazil.

The United States is not a party to this union, probably for the reason that any mark registered in the union is to be regarded as a mark registered in the country which is a member of the union irrespective of whether the mark has been used in the country or not. Since all trademark rights under our own laws flow from the result of use of the mark it would appear to require a fundamental change in our attitude in order that we might give effect to international trademark registration, such as that of the Union of Berne.

It does not seen to me to be contrary to our interests to join the Union of Berne, even though we may have to change our traditional attitude in regard to trademark protection, because our willingness to align ourselves with the rest of the world is a step toward the international solution of these trademark problems, which after all is the only final solution.

International action must be taken to stamp out trademark piracy, and for this reason I believe that at the close of hostilities, when we hope that all the nations will come together—not merely the nations now at war, but also the neutral nations—to endeavor to solve those problems of unfair international competition which are the cause of so much bad feeling we should urge the proposal that a treaty be negotiated with foreign countries throughout the world whereby valid registration of a trademark shall not be granted in any of the signatory countries where the trademark is already the well-known property, either by registration or by use, of a concern located in another signatory country. An international trademarks union establishing this high moral principle would go a long way in solving the problems of international trademark protection.

If this paper has created the impression among you that because of possible future developments it is unnecessary to register your trademarks in the various foreign countries, then it will have failed of its purpose.

The Future

Perhaps it is a dangerous matter to forecast the future, particularly as what I have stated in regard to the desirability of international arrangements and the possibility of putting these through may leave the impression with some of you that it is not now necessary to register your trademarks abroad, as you can avoid the expense by awaiting the completion of such international arrangements as may be instigated by our State Department. To wait for the consummation of such international arrangements, some of which are perhaps beyond the horizon of possible accomplishment, would be an extremely dangerous thing.

Such international arrangements of the breadth we desire cannot be made in a day, and, in fact, experience shows that many years usually elapse from the time of the inception of an international arrangement of this character to its actual successful operation. The Pan-American Union is a good example of this. While the agreement was actually concluded Feb. 23, 1911, over seven years ago, the International Registration Office has not yet been established, and it may be many more years before the actual effect of the agreement will be established to such an extent that American traders will know exactly where they stand by taking advantage of this union. Much water has flown down the Hudson River since 1911, and hundreds of American trademarks have been pirated in the Latin-American countries since the signing of this agreement.

You, as good business men, must consider the condition as it is today, and if you are doing business internationally you cannot, for any consideration of what the future may bring, neglect the present. You cannot afford to let some one steal your trademark while you are waiting for the millennium. For the present, therefore, it is incumbent upon American traders desiring an export business to register their trademarks abroad before they are stolen by others.

Sparks from Industry's Forge

Edited by E. C. Porter

Some 200 concrete vessels of various sizes representing 200,000 tons of shipping are being built on the west, south, northeast and northwest coasts of England, on the Clyde and at Aberdeen in Scotland, and near Belfast, Ireland. The capital outlay, aside from the cost of land and construction of the plants, is estimated at nearly £4,000,000. The designs adopted save about 70,000 tons of steel. The project has advanced so far that several vessels of 1000 tons net weight carrying capacity are now nearing completion at present.

* * *

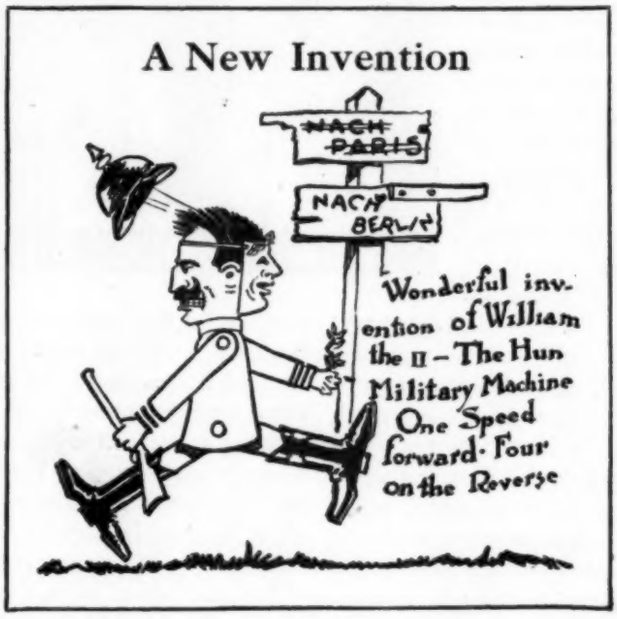
Restrictions on manufacturing tin-plate food containers have been removed by a joint agreement between the War Industries Board and the Food Administration. The trades affected are manufacturers and packers of baking powder, ground spices, powdered cocoa and chocolate, and other articles of foodstuffs using tin containers.

* * *

In a new ruling the War Trade Board announces that it has postponed the date of the ocean shipping preference program, which was announced on Nov. 11, 1918, regarding shipments to Argentina, Brazil, Paraguay and Uruguay. Applicants are informed that it is unnecessary until further notice to attach form X118 to their applications for shipments to these countries.

* * *

Waste materials collected during the past four weeks by the Conservation and Reclamation Division (now Salvage Division) show that there were collected 8,677,047 lb. of iron, 541,646 lb. of old metal (aluminum, brass, copper, lead and zinc), 335,073 lb. of rubber; 1,163,545 lb. of cotton rags; 527,043 lb. of woolen rags; 140,172 lb. of rope; 2,773,763 lb. of paper; 1,329,680 bags; 494,498 lb. of burlap; 195,505 lb. of leather; 360,474 lb. of bottles and jars, 198,969 barrels and boxes; 15,073 lb. of horse and mule hair; 1,832,820 ft. of lumber, and 156,562 lb. of miscellaneous waste. These materials were either sold or turned over to various Army organizations, the sales bringing $106,772. Manure brought $31,650, and garbage and miscellaneous waste $61,361, making a total of about $199,784. Reports from 18 camps, fields and proving grounds show 2593 acres of gardens producing fruits, vegetables and hay.


A New Invention
NACH PARIS
NACH BERLIN
Wonderful invention of William the II – The Hun Military Machine
One Speed forward · Four on the Reverse

The machine-tool industry in Switzerland has made great strides during the late war. Compared with 1913 the exports have been phenomenal, France taking 40 times as much as in that year and Italy about 30 times, while even Germany's demand increased by 300 per cent. The machines exported comprised engine and turret lathes, thread-milling machines, tool-grinding machines of various kinds, and drilling machines.

* * *

"Memorial trees" for the soldier dead in the world war will be planted all over the United States next spring, if proposals of the American Forestry Association are carried out. It is intended to plant "victory oaks," "victory walnuts" and "victory elms" along the Lincoln transcontinental highway and other great roads.

* * *

Disabled soldiers, physically and mentally fit for some kind of labor, will be placed in the yards of the Emergency Fleet Corporation all over the country as speedily as vacancies occur in the regular forces. This statement was made by the general manager of the corporation, who said that there was no intention of displacing skilled, faithful employees, but whenever a vacancy occurred it would be filled by a wounded veteran. The wounded men who were skilled mechanics, but who are not able to take up their old trades, will be specially provided for by the corporation.

* * *

Vocational reëducation and employment of disabled soldiers in Italy, which early in the war was carried on by private relief services but was taken over by the government in 1917, has reached a high degree of efficiency. First of all the disabled man is given a pamphlet explaining to him that under the law he is entitled to medical attendance, free equipment with artificial limbs and maintenance for 6 months in a school of reëducation. Although reëducation is not compulsory in Italy every disabled man is required to spend 15 days in the reëducational schools and is thus made to realize the opportunities open to him. The trades generally taught are shoemaking, tailoring, saddlery, carpentering, general mechanics, cabinet making, bookbinding, basket making, wheelwright and cooper, bookkeeping, typewriting, drawing and telegraphy.

The Editor Asks You

WE have always looked upon the *American Machinist* as a machine-shop tool. As the makers of this tool, which has been on the market for forty years, we take a pardonable pride in our product. Any shop that makes a product that is not worth while to take pride in had better go out of business.

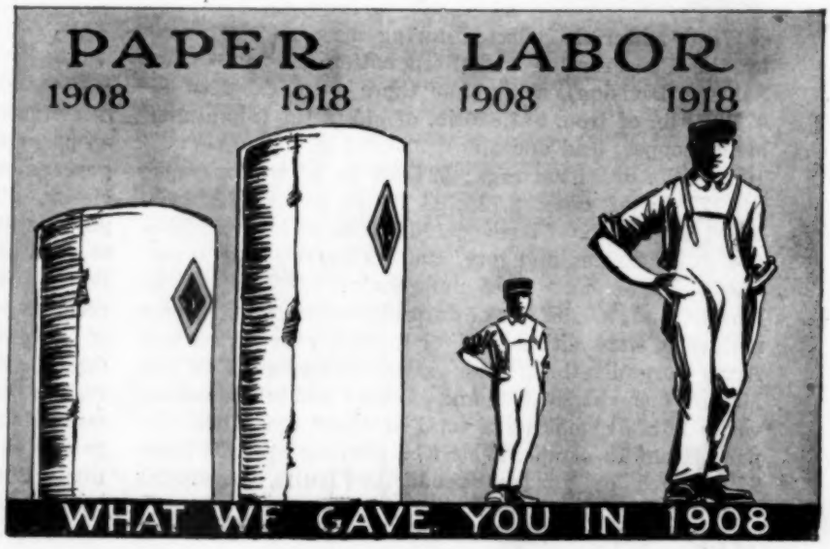
We want you to keep this honest and honorable pride of ours in mind while we call your attention to some of the things that this shop tool has accomplished and some of the improvements that we are now putting upon this tool to make it even more efficient.

We aim to serve the machinery-building and machinery-operating industry both from within and from without. There is scarcely any need of explaining how we serve the industry from within, for all of our readers know what an issue of the *American Machinist* contains. They know that this shop tool is not designed merely to earn 10 or 15 or 25 or even 100 per cent. on what is invested in it, but that the idea value of the *American Machinist* as to ways of doing work better and at less cost often brings returns of thousands of dollars to the men who apply them.

Serving the industry from the outside is just as important as serving it from the inside. The *American Machinist* aims to do this by elevating the standard of public appreciation of the machinery building and operating industry. We do not hesitate to approach Congress or the executive branches of the Government when the welfare of your industry demands such steps to be taken. We have had a wonderful opportunity to do this during the past two years, and can assure you that many legislative officials who were formerly in the dark about it are now familiar with the important part that our industry plays in the national scheme of economics. It is not surprising that our industry has received so many setbacks when it is considered how little those who make the laws and carry on the business of the Government knew about us.

We would like every reader of the *American Machinist* to visit our plant and see what it means to edit and publish this paper. Most of you would be surprised to know that we have more editors on the *American Machinist* than you would find on a large daily newspaper. This is because we must cover not only the whole of the United States but must get the latest developments from foreign countries as well. For this reason our editors travel all over this country and have frequently journeyed to Europe in order to make sure that if there is anything worth while in the machine-shop field it is quickly made the property of our readers.

We are proud of our record in the field of munition making. Two years before the war, in order that American machine shops might have available the latest information on munition making, we began to describe what Canadian and American shops were doing for the Allies. When our entry into the war became imminent we had already put at



to Consider some Facts

the disposal of American shops and American engineers descriptions of munition-manufacturing methods, jigs, fixtures and special tools which were equivalent in the space required to present them to the complete works of Shakespeare. As a result we have hundreds of commendatory letters from industrial leaders who state that this information was "of inestimable value." We like to think that the *American Machinist* can claim to have done its bit in the winning of the war.

So much for a few of the things that we have done and now for what we are going to do.

For the past twenty months the best brains of America have been working overtime to turn our industry upside down. The machine-shop industry has been completely revolutionized. Every man in it has been affected. Thousands of shops have learned the meaning of quantity production and limit-gage inspection for the first time. When our industry gets back on a peace footing again it will be a changed industry. Methods that were good enough to get away with before the war will be entirely out of the question now. The man who is going to run a shop with profit or to hold a responsible job in the machine-shop industry will have to make as thorough a study of his profession as does the lawyer or physician.

The *American Machinist* has foreseen this development and has prepared to meet it by supplying you with the latest tried methods (not fads) in management and with the most up-to-date information (not experiments) on machine operation and construction. In addition to this through our Reconstruction News Section we will keep our readers informed of the vitally important developments in readjustment.

For nineteen years the publishers of the *American Machinist* have held its subscription price at $4 a year. What this has meant in value given and received is graphically shown in the illustrations on this page, which compare 1908 with 1918. We do not believe that any man among many who has consistently read the *American Machinist* during these years but will agree that its value has increased.

We are now face to face with the necessity of raising our subscription price. In considering this increase we are not taking into account the destructive legislation of the new postal law, by which postage on each subscription of the *American Machinist* in 1921 will be $2.87. We figure that this foolish legislation will be soon reversed.

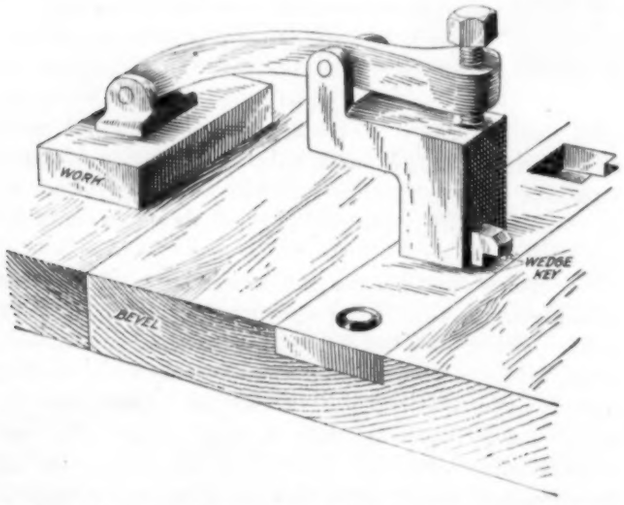
But to compensate in part for the doubling of the cost of paper, labor and editorial expenses and the tripling of the price of engravings, we must, after March 1, 1919, make our subscription rate $5 a year. We know that those of you who study the diagrams on this page will not criticise this increase, but rather commend us for holding out so long against it. We ask your usual hearty coöperation in this as well as the continuance of the friendly relations that have made the editing of the *American Machinist* a pleasure.

An Efficient Bench Hold-Fast

By Charles H. Willey

There is always a certain class of bulky work that cannot be held in the regular bench vise while chipping, filing or fitting, and to hold this sort of work handily I evolved the type of bench clamp shown in the sketch.

A length of ¾ x 1½-in. flat bar stock with square



holes and wedge keyways cut in it at intervals of 6 in. is fitted into a plank of the work bench, permitting the hold-fast to be used along the bench at needed places.

The device is adjustable to a considerable range of height and is held securely by a taper wedge key, a light blow upon which secures it, and it is as readily loosened with a small pinch bar when a change of height is desired. If it were desired to use the clamp at different angles the shank instead of being square could be made hexagon, and the holes in the bench strip made to match. Several of these clamps are employed, two often being used on one job.

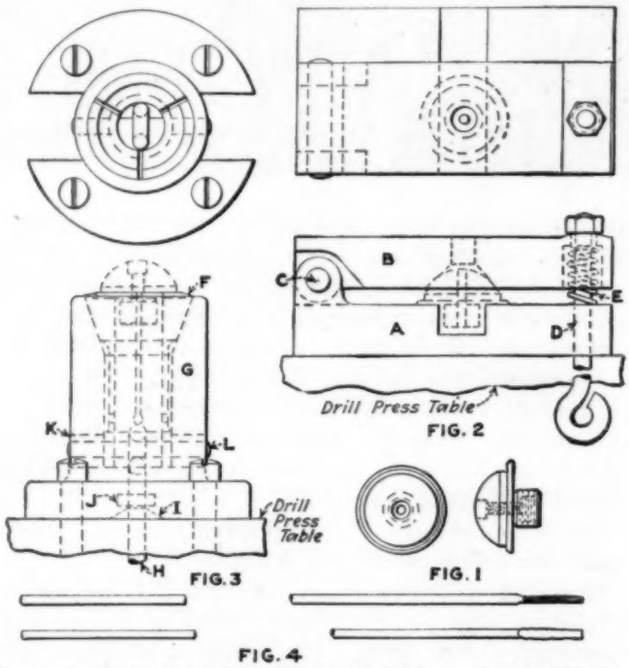
Foot-Operated Fixtures for Drilling-Machine Work

By John A. Shand

The cap shown in Fig. 1 comes from the automatics all finished except for tapping the center hole and counterboring for the screw head.

The fixture used for the counterboring operation is shown in Fig. 2 and consists of two parts, *A* and *B*, hinged together at *C*, the upper part being operated by a foot treadle connecting with rod *D*. A spring *E* keeps the fixture open when the treadle is released.

The work is inserted at the side with one hand, leaving the other free to operate the drill-spindle lever. When part *B* is raised the work is free to move along



FIGS. 1 TO 4. FOOT-OPERATED DRILLING AND TAPPING FIXTURES

Fig. 1—The piece to be drilled and tapped. Fig. 2—The drilling fixture. Fig. 3—The tapping fixture. Fig. 4—The tap

the slot milled in the bottom portion, and the insertion of successive pieces pushes the finished ones along and out of the end of the slot. This method of operation is speedy and is applicable to many other kinds of drilling-machine work as well.

For the counterbore a twist drill is used of the size of the counterbore with the end ground to the size of the tap drill.

The tapping fixture is shown in Fig. 3 and, like the counterboring fixture, is operated by a foot treadle. It consists of a collet *F*, which is shaped to grip the cap around the edge as shown, a holder *G* for the collet, and a connecting-rod *H*. The latter must be a nice fit in the table of the drilling machine to keep the oil from leaking around it. The cone-shaped piece of lead *I* and collar *J* help to make this joint oil tight.

The collet holder *G* has a wide slot milled through it to allow the chips and oil to flow out. A smaller

slot is milled at *K* for the pin *L*, which not only connects the pull rod *H* with the collet, but keeps the collet from turning around.

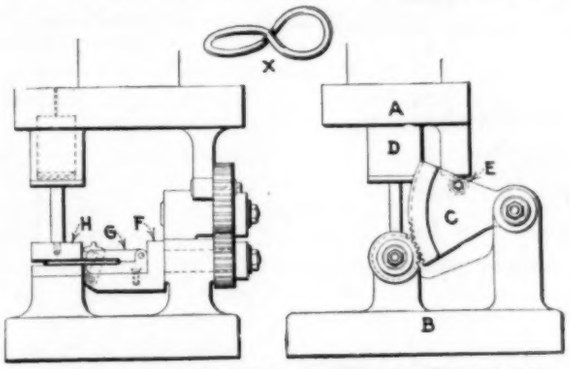
A long-shank tap is used and is run clear through the pieces which are left on the shank until it is full instead of backing out the tap each time. When the shank is full it is taken out of the chuck and emptied like a regular nut tap.

This tap is shown in Fig. 4. A flat tap of this shape has proved to be better than a three or four fluted tap. The long shank acts as a torsion spring and has reduced the breakage of taps, as compared with short-shank taps, at least 50 per cent., as well as doing away with backing the tap out each time.

A Twisting Operation in the Punch Press

By Joseph A. Ahlers

An addition to the already numerous operations performed on the punch press is that of twisting, the cut showing a twisting fixture designed for use in this



TWISTING FIXTURE FOR USE IN PUNCH PRESS

manner, which insures accuracy and greater speed than could be obtained by hand-bending fixtures.

The piece to be twisted is an eye, or link, as shown at *X*. It is made of ⅜-in. steel, and is first welded to form an open link. The operation requires a three-quarter twist or three-quarters of a complete turn.

Describing the fixture, *A* is the plunger or top plate, and *B* is the base. The segment *C* is operated on the down stroke of the press by the boss on the top plate riding on the roller *E*. At the full stroke of the press the gear that meshes in the segment has been given a three-quarter turn. This gives a corresponding turn to the shank *F*, which holds the chuck *G*. This chuck is merely a base and a hinged top plate which locks with a latch after the link is in place. *H* is the anvil arrangement that holds the other end of the link.

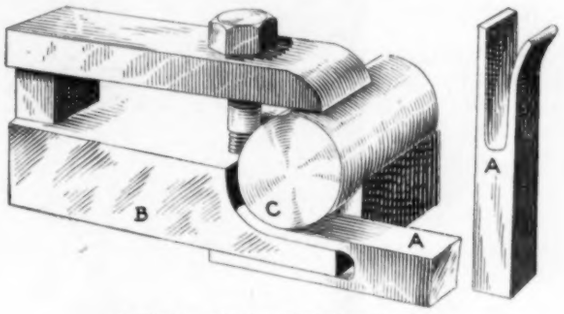
Both the chuck and the anvil are formed to fit the link, with clearance allowed for the amount of material used up in twisting. The anvil top plate holds the link in place during the twisting by means of the air cylinder and piston *D*. The anvil is opened at the full upstroke of the press, so that to remove the work the chuck latch is opened and the hinge plate swung back. The parts are returned to place by a spring after the pressure on the anvil is released by the rising of the gate. The link is shown in place in the fixture by the heavy lines.

Special Hand-Bending Jig

By John T. Clarf

The sketch here shown is that of a simple bending operation which worked very satisfactorily on a job I had a short time ago and may be of interest to others.

A is the piece to be bent as shown, and is made



SIMPLE HAND-BENDING JIG

from ⅜ x ⅝-in. cold-rolled steel. A slot was cut in the block *B*, ⅜ in. wide, to suit the inside radius of the bent end, leaving a wall in the block to fit the slot in the piece to be bent. A radius was then cut at right angles to the slot to fit the plug *C*, which is the same radius as the outside of the bend.

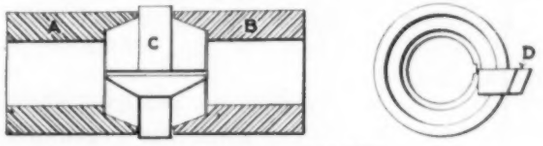
Plug *C* is held in position by a strap and leaves an opening under it to fit the piece to be bent, which is driven in as shown until bent to the required dimensions. The plug is then taken out and the piece removed.

A Holder for Fly Cutters

By John Miles

Victoria, Australia

The holder that is illustrated in this article is intended for use on the milling machine, the tool shown in the sketch being made for a 1-in. arbor. It consists of the two collars *A* and *B*, the centerpiece *C*, and the cutter *D*, which may be of suitable length for the work in hand. The collars are made a good fit on



FLY-CUTTER HOLDER

the arbor with the outer faces and the tapered recess ground true with the bore.

The centerpiece is carefully fitted to the tapered recess, leaving about ½ in. in the middle parallel. The taper should be about 30 deg. included angle and the bore from 0.005 to 0.01 larger than the arbor.

This centerpiece is then slit on one side clear through to the bore with a $\frac{1}{16}$-in. saw and the slot enlarged to ⅜ in. in width for the larger portion of its depth, as shown in the cut. The slot should be so located as to bring one side radial.

The thickness of the cutter is made to just press into the ⅜-in. slot. Thus when the arbor nut is tightened the cutter is clamped firmly in position. I have used this device for some time and have never had a cutter work loose.

IT NEVER MUST HAPPEN AGAIN...

By Fred H. Colvin

We have fought our fight in the Yankee way,
With never a thought of fear;
We have held the Hun day after day,
We have kept the Prussian guard at bay,
Though we trained but a single year.

We turned our shops from their peaceful ways
To the making of shot and shell;
We have worked by nights as well as days
With forge and furnace all ablaze,
We have done our duty well.

But we all give thanks as best we may
That the greatest of wars is done;
We each rejoice in our special way,
We each must work day after day
To keep the peace we've won.

And never again in the days ahead
Must it be in the power of men
To turn the fields and rivers red,
To fill the world with countless dead—
It never must happen again.

EDITORIALS

In the Meantime Send in Your Bills

WE EARNESTLY hope that the suggestion made in last week's *American Machinist* that the Government assume the responsibility for contributory war contracts and for the gradual reduction of these contracts will be adopted. It appears to be the only way in which industry can be readjusted without a severe shock. The urging of this policy by you upon those officials with whom you are acquainted or who represent you will go a long way toward the adoption of some such business shock absorber.

The wise man, however, while hoping for the best, will prepare for the worst. In view of this all who have contracts which are possibly in danger of repudiation will be interested in the following statements concerning the legality of canceling contracts which do not contain specific cancellation clauses.

Under the general principles of contract law the purchaser assumes damages for all the labor, material, overhead and administrative expenses that have been applied on the contract up to the date of cancellation, as well as a sum representing a pro rata of the profits based on the state of completion at the time of cancellation. In other words, if a machine was three-quarters completed the sum recoverable would be the total expense incurred in bringing it to this state of completion and three-quarters of the total profits, allowing credit on salvage value.

In order to collect on a canceled contract, however, it is necessary for the manufacturer to present a detailed itemized bill to the purchaser, stating the above expenses and profits chargeable up to the date of cancellation.

If a contract has gone beyond its promised delivery date and it is canceled at a later date by the purchaser, the date of cancellation and not the date of promised delivery is the governing factor. In other words, if a contract was promised for delivery Nov. 1, and the manufacturer did not succeed in meeting this delivery, notwithstanding which the purchaser made no cancellation but allowed the contract to run, and later on Nov. 12 canceled this contract, the sum to be recovered by the manufacturer would include the cost and pro rata profits to Nov. 12.

Many manufacturers who have received cancellations are completing the machinery or material involved with the expectation that it will be possible to force the purchaser to accept the completed articles when finished. There is no basis for this expectation under the law. The thing to do when a contract is canceled is to send in your bill for damages.

Naturally the general good requires a sane application of legal remedies, since Uncle Sam in the long run will have to pay the damages. There must not be a tendency to do unnecessary work in order to increase the bills. American manufacturers will not hold out for unnecessary exactions but must protect their business.

Demobilizing the Machine Shop

THE problem before machine builders and others at present is that of keeping their plants in operation, maintaining their organization and changing over to their regular work as soon as this can be done.

Unless the war machines are well along, say 50 per cent. finished, it may be the part of wisdom to shift labor to other work until definite information can be obtained. Fortunately most shops have other work to keep them busy, and they can, with the aid of the Priorities Board, divert deliveries to other customers.

The main thing is to keep going, to avoid hysteria, to have faith in the future and to remember that as patriotism is often more difficult to practice in peace times than in war times it becomes all the more praiseworthy. We must be as loyal and as patient in peace as we were in war.

Transforming the nation from abnormal to normal conditions cannot be done at once, nor should it be attempted. The men in charge of affairs, many of them the brainiest and sanest in the country, representing every section of the union, realize this fully.

The machine builders have been of inestimable service to the country during its struggle. They have served it well and for the most part without being open to the charge of profiteering. This reputation must, for the good of the industry, be maintained during the readjustment period; but work now under way must be carefully handled if this reputation is to go down on the records.

Investigations are sure to be made in many directions, and unfinished contracts will be carefully scrutinized. There is every disposition on the part of those responsible for placing orders for machinery to be fair, for they are acquainted with the efforts made to get the machines needed in record time.

The machines for the gun-lining plant in France is a good example, as it entailed some $18,000,000 worth of machine tools. Very few of these machines are ready, but many are well along toward completion while others have hardly been started. Overzealous officers, with an ardor worthy of being backed by better judgment, tried to hold up payments that were clearly due. This action was, however, overruled by those high in authority, and there is every reason to believe that an equitable settlement can be looked for in every case where the contractor honestly shows his desire to coöperate with the War Department.

Minor officials may get out of hand and send notifications that would be disturbing without this assurance ing fairly and by showing a desire to meet the depart- from those higher up, but by not getting excited, by act- ment half way, we do not believe there will be cause for dissatisfaction.

We feel sure that it is the intention of those in charge of the War Department to deal justly and fairly with all concerned.

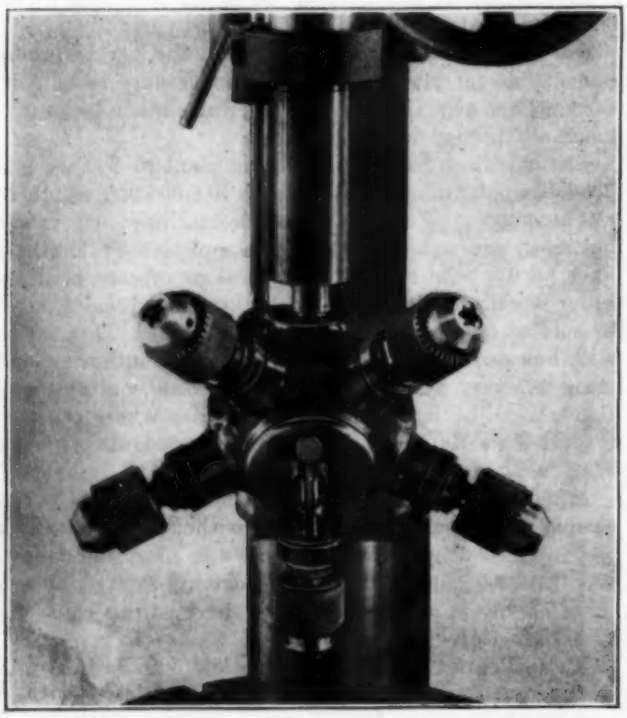
SHOP EQUIPMENT NEWS

Edited by
Stanley M. Banfield

In conformity with a Post Office ruling, descriptions of new equipment can only be used in this department which have not been previously or simultaneously advertised in this or any other periodical.

"Fortin" Turret Drill Head

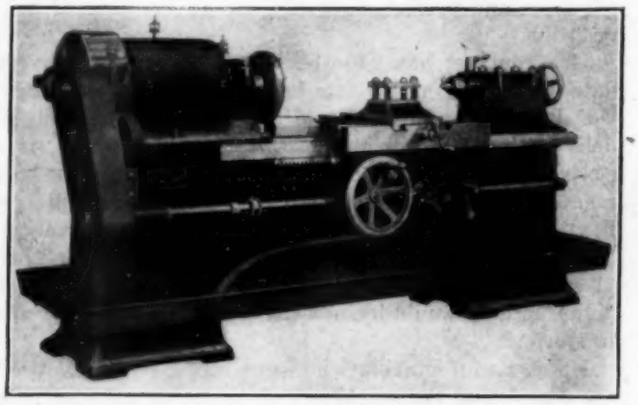
The Spafford Tool Works, 10 Hoadley Pl., Hartford, Conn., have recently placed on the market the new type of "Fortin" five-spindle turret drill head shown in the illustration. This has been brought out on account of the demand for a small-sized turret drill head to be used on large drilling machines, and it is built in two styles and in various sizes. The driving arbor fits into the spindle of the drilling machine, while a separate piece is clamped to the sleeve and an adjustable rod connects the head to this sleeve and prevents it from revolving or from falling out of the spindle. The head is indexed by pressing the lever shown at the front, and the turret may be revolved in either direction while the machine is in motion, all spindles but the one in operation remaining idle.



"FORTIN" FIVE-SPINDLE TURRET DRILL HEAD

"Fulton Type B" Munition Lathe

The Dale Brewster Machinery Co., Inc., 541 West Washington Blvd., Chicago, Ill., has recently placed on the market the "Fulton Type B" munition lathe shown in the illustration. The headstock is of the all-geared, single-speed type driven from a single pulley; all gears are of steel and pinions are heat-treated. Gearing is completely inclosed and the drive shaft runs on three Hyatt roller bearings. The intermediate shaft has



"FULTON TYPE B" MUNITION LATHE

Swing over bed, 20½ in.; swing over tool slide, 9½ in.; distance between centers with 8-ft. bed, 38 in.; length of bed, 8 or 10 ft., as desired; width of bed, 20 in.; depth of bed at thinnest point, 17½ in.; width of ways, center to center, 17½ in.; height from floor to spindle, 42 in.; front spindle bearing, 4½ x 8 in.; rear spindle bearing, 3 x 6 in.; spindle nose, 3½ in. in diameter, 4 in. long, threaded, four pitch; diameter tailstock spindle, 3½ in.; taper in spindle and tailstock, No. 5 Morse; spindle gear, 13⅞ in. P. D., three pitch, 2¾-in. face; drive pulley, 18 in. diameter, 6½-in. face; length of carriage on ways, 31 in.; width of bridge, 11 in.; feeds per revolution of spindle, ⅛ in., or less to order; approximate weight, 6300 lb.

bronze bearings, while the spindle bearings are bronze-bushed, sight-feed oilers being used throughout. The spindle is made of a hammered-steel forging of carbon steel and is finished by grinding. End thrust is taken care of by a ball thrust bearing at the rear end of the headstock, an adjusting nut being provided to take up any wear. The rear end of the spindle is threaded to permit the application of an air cylinder if this is desired. All of the power feed gears are of steel, except one, which is cast iron, this being used in order to introduce a safety device. The apron is of the double-plate type, all shafts having bearings in both the front and back plates. Power longitudinal feed is secured through a taper-cone friction 9½ in. in diameter, a feed reverse being incorporated. The carriage slide is gibbed both at the front and rear and is equipped with a slide of the plain type with European-style toolposts, four 1-in. studs being used for clamping the tool. Power cross-feed can be furnished as an extra if desired. The tailstock is of the solid type with a 3½-in. diameter spindle. The amount of overhang of the front end of the spindle has been reduced to a minimum, and a double nut-type clamp is used to hold the spindle in a fixed position. The tailstock is clamped to the bed by four 1-in. bolts. Box-type braces are used for the bed, which has V-ways. A pressed-steel chip pan is also furnished as regular equipment. The machine is furnished with either an 8-ft. or 10-ft. bed, as desired, the latter being recommended for boring operations when air collet chucks are used. Standard equipment includes tight and loose pulley countershaft, steel oil pan, oil tank, one set of feed gears, necessary wrenches, etc. If desired, the lathe may be equipped with the following special extras: Ten-foot bed for boring operations, 20-in. hexagonal turret, 16-in. hexagonal turret, air-operated collet chuck, air-operated or cam-type driving mandrels, double-slide carriage with two tool rests, profiling attachment for turning outside or inside profile of shells, and special tools for base chamfer-band grooving, base grooving, centering, etc.

American Shell Chuck

The collet-type chuck shown in the illustration for shell or other similar work is the product of the American Pneumatic Chuck Co., 9 South Clinton St., Chicago, Ill., and is marketed by Neidow & Payson Co., of the same address. Fig. 1 shows a cross-section view of the chuck and Fig. 2 the collet or draw tube alone. The pull of the draw rod is directly on the jaws, which is claimed to relieve the hinge pin of stresses and insure perfect alignment of the jaws at all times. The grip secured through the long, slow taper bearing on the collet is increased by sliding, hardened tool-steel grip blocks with milled teeth inserted in the front ends of the jaws. Should the air pressure be reduced, or the cut be increased to such a point that the work

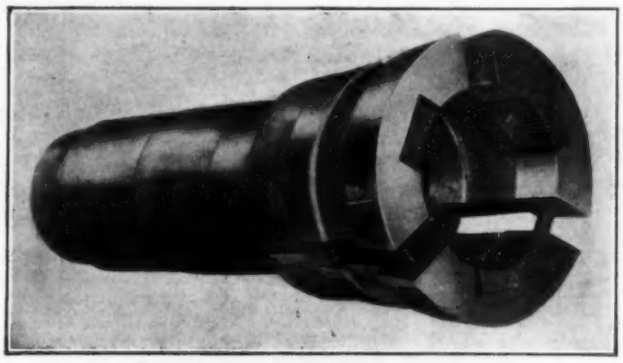


FIG. 2. THE COLLET REMOVED FROM THE SPINDLE

commences to slip, the grip blocks will slide in the tapered jaw slots, thereby increasing the grip. Perfect alignment of the work is also maintained by an additional plain gripping surface in the rear end of the jaws. It is claimed that this type of chuck can be operated with a smaller air cylinder than usual, thus saving considerable air and reducing the operating cost. This chuck was primarily designed to hold 6-in. steel forgings for rough boring, but can be furnished for work of other diameters if desired.

Kar Sine Angle Plate

The Kar Engineering Co., 79 East 130th St., New York City, has recently placed on the market the sine angle plate shown which will measure angles in any part of the quadrant without special measuring tools except an ordinary 2-in. micrometer. The device consists of a movable plate swiveled on a stationary base, the movement permitted being through a full quadrant. The motion of the plate is controlled by the telescopic adjusting screw which permits quick and accurate setting. A clamp is provided for holding the screw after the adjustment has been made, and this together with the clamping sleeve and nut with which the main pivot is provided locks the table rigidly in position. The sleeve is made to slide lengthwise, but is prevented from turning by a key between itself and the plate lug. By this arrangement both lugs of the plate are held without being subject to distortion. Measurements are taken over either of the two pins or buttons and the underside of the overhanging plate located just below the main pivot. Two pins are provided so that the sines on both the angle and its complement can be used, these

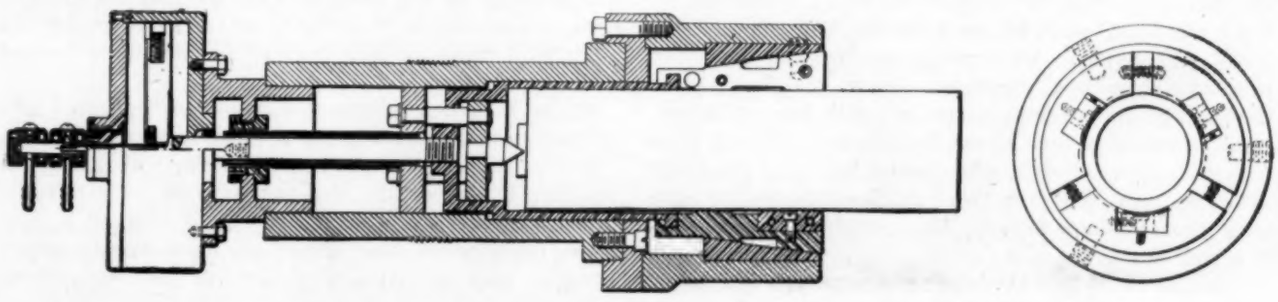
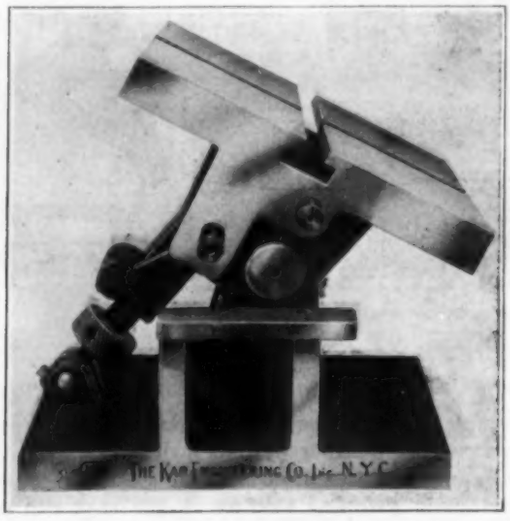


FIG. 1. AMERICAN COLLET-TYPE CHUCK FOR SHELL OR OTHER SIMILAR WORK

readings corresponding to the values of sine and cosine given in any table of trigonometric functions. Using a 2-in. micrometer the distances between the measuring baseplate and the respective pins are such that the extra



KAR SINE ANGLE PLATE

Working surface, 5¾ x 5 in. with T-slots for clamping work; height with table horizontal, 5 in.; swing of plate, 90 deg.; micrometer used, 2 in.

inch to be added to the actual reading for an ordinary measurement is counteracted, and the readings indicated on the micrometer spindle represent the trigonometric values for the proper angles.

The Quality of Foremanship

BY HARRY SENIOR

On page 661 of the *American Machinist* E. Andrews, writing under the heading "The Modern Foreman, What Is His Present Job?" mentions a few of the specifications to be met by candidates for foremanship, who he says must be the fortunate possessor of the following characteristics: Character, method, resourcefulness, foresight, confidence [self], courage, patience, perseverance and tact, and as if these were not sufficient burden for one poor mortal to stagger under, and only a foreman at that, he must also have the qualities of judgment, inventive faculty, wide practical experience and sound theoretical knowledge backed by initiative and organizing ability.

I have not the slightest doubt that such a man would make an excellent foreman—if he could find time—although I am under the impression that he would be too busy being the managing director of some giant industrial enterprise or perhaps in being President of the United States to bother with machine shops.

We will have to be content to struggle along for awhile with men of somewhat lesser qualifications at the head of our machine shops, but this does not necessarily mean that such shops need be less efficient than formerly. The officials who do the selecting for these positions must look for two qualifications in the man they choose—knowledge of the machine business and common sense.

It may be said that the latter endowment is too vague, and so it is, on paper, being one of the most elusive things in the world when one tries to describe it, yet it is also one of the most easily recognized when one is confronted by its fortunate possessor. It is a psychological condition that is felt rather than observed.

It may be that common sense is a compound of all the desirable things set forth by Mr. Andrews, though the possession of many of them even to a considerable degree does not stamp their possessor with the hallmark of leadership. I have known men who were inventive, resourceful, patient, persevering, etc., who have spent the best years of their lives in making perpetual-motion devices, but who were lacking in common sense, perhaps because their "theoretical knowledge" was unsound.

Again, there are men possessing courage, method, confidence and more or less initiative who have fallen victims to fads and have "systemized" and "engineered" their shops out of business, probably because they were deficient in understanding human nature, which is one of the requisites enumerated by Mr. Andrews.

Though I have said that common sense is a very elusive thing to describe I am going to make a stab by defining it as reasoning power; the ability to balance one condition or set of conditions against another and deduce the result correctly; to be able to add, subtract, multiply and divide in terms of human nature, of natural forces, of mechanical laws, or whatever else may be under consideration, as well as to be able to make the same calculations in figures, and have the result "come right."

Two and two make four not only in the copy book but in the world of material things, and he who would make the sum three or five either does not know how to add or has failed to properly appraise the value of one or other of the twos.

Nowhere in the world are the values of the factors to be reckoned more arbitrarily fixed than in the machine shop; nowhere are results more inexorable. In many lines of endeavor faulty judgment and specious reasoning may camouflage failures into apparent success, may serve to tide a business over a critical period to a less critical one, but in mechanics the laws of nature are rigorously enforced and her judgments are instantaneous. Therefore a man who would be a leader in this field must first of all know his business, must be able to grasp mentally the true value of conditions as they present themselves and know how to work them together to produce the results he desires.

If what he wishes to do requires tact he will use tact, not because he is tactful, but because tact is a tool which he must know how to handle. So with patience, method, perseverance and most of the other virtues mentioned by Mr. Andrews.

The leader in the machine shop is—like the artist—born, not made, but if either he or the artist makes the mistake of thinking he is born all finished he is doomed to disappointment.

While I do not believe it possible to "educate" into an exceptional mechanic, as a good foreman must be, a boy or young man who has no mechanical instinct or leaning, I am certain that no amount of congenital talent will ever make such a mechanic without a thorough training in the school of hard knocks which Entropy once admitted was effective but not entirely efficient.

RECONSTRUCTION NEWS

TIMELY INFORMATION *for* LIVE MACHINE SHOPS

Washington, D. C., Nov. 23.—Every department of the Government realizes the necessity of exercising care in the curtailment of the strictly war industries. Different officials naturally view it from different angles, but Bulletin 13 issued by General Goethals, Director of Purchase, Storage and Traffic, outlines the general feeling in the matter and it may be assumed expresses the mode of procedure in most cases.

This order states that no cancellation of contracts can be made effective until the matter has been passed upon by the office of the Director of Purchase, Storage and Traffic, which will confer with the War Industries Board. No cancellation or modification is to be made until after the following four points have been considered:

The effect on the industry as a whole; the effect on labor conditions; the effect on the given locality, and the effect on the given contractor.

Contracts will be canceled where the contractor is willing to terminate the work and will state in writing that such cancellations will not disturb labor in his plant.

Any order placed since Oct. 1, 1918, may be replaced, suspended or canceled as seems best to those in charge, but there need be no fear that a just settlement will not be made for any expenses actually incurred. Notice is given that no new labor should be employed without the approval of the Producing Office, nor shall any new contracts be placed by contractors for supplies or with subcontractors without similar approval.

Industrial Demobilization

Assistant Secretary of War Crowell is in special charge of industrial demobilization, and being a business man of known business reputation he can be depended on to use good judgment in his decisions. The following statement has been issued by him:

It is also essential that the production of material for war, which means now a waste of material that could be used for the civil population here and for the purposes of reconstruction in Europe, should be stopped as speedily as is consistent with the primary consideration of labor and the industries. Instructions have therefore been issued to all bureaus of the War Department, governing the methods of slowing down of production, so that as far as possible there should be a tapering off of war work, giving time for industrial readjustment and for the industry to take up civil work.

So that manufacturers might as rapidly as possible get into work on civil needs, at our request the War Industries Board has withdrawn all priority ratings on Army work.

No order is being suspended or canceled by the War Department without considering the nature of the work and the locality where the work is being performed; labor and the reëmployment of labor at such places in other industries, and without conference and consultation with the War Industries Board, which has been constantly in touch with the industries of this country, and with the Department of Labor, which is in intimate touch with the conditions of employment in all parts of the United States.

Overtime, holiday and Sunday work has been stopped, and as rapidly as possible and as rapidly as the labor can be used in normal day shifts night shifts will be discontinued. It is often the case that in a certain locality where labor is working on a war project this work may be stopped and the same labor utilized on other work in the same locality.

During the war production has been largely diverted from articles called for in times of peace to war necessities, and civil needs have been curtailed and nonessentials largely eliminated. With the assistance of the War Industries Board the articles for war necessities are being rapidly curtailed and the industries proportionately freed to work on civil needs. Industries that have been largely concentrated in certain areas with resultant congestion of transportation, with a great influx of labor in this area, with inadequate facilities for housing, etc., are being taken into consideration in this readjustment.

The two standards which the War Department has set up for itself are that these contract readjustments must be made (a) equitably, in regard to the industry and labor, and (b) promptly, to safeguard the financial elements of the problem.

Those in charge are giving evidences of their responsibilities and are carefully considering the various phases of the problem. The questions of labor and raw material are probably uppermost in the minds of all, and while many want to end all Government control as quickly as possible it is realized in the case of raw material at least that relaxation at the present time is fraught with danger.

The Control of Metal Prices

The metals of our own industry—iron, steel and copper—are all controlled, and except for the producers of those materials we are pretty well convinced that they are abnormally high. This being the case the user of these metals is not going to stock up with any more raw material than he needs to keep production going. In other words, as long as uncertainty exists, or we might say as long as we are reasonably sure that the prices of these raw materials will be from 20 to 40 per cent. above normal, we will do a hand-to-mouth business.

In May, 1917, iron men told us in Cincinnati that while the cost of iron had risen from about $14 to $18 a ton they were charging $55 because they could get it and wanted to make up for the preceding lean years. With this as a basis, and the probability that the cost of production has not materially increased since that time, we may safely look for iron at from $20 to $25 under normal conditions. The question is, Is it better to remove all control and have the users of iron buy from hand to mouth to obviate being caught with a lot of high-priced iron in the event of a sudden drop, or to maintain control, announcing perhaps a sliding scale to reach $25 in a year, after which it can be left to the tender mercies of the regular channels of trade?

The War Industries Board is endeavoring to so reallocate raw material as will encourage the resumption of regular business and in this way help the general situation. There are so many angles to the subject and so many ways in which the different agencies are at work that it is difficult to record them all. But while the situation is complex and we are all anxious for the future it is a relief to know what is being done and to be assured that some of the keenest minds in the country are at work on the problem.

Nor should we forget the desire of these men to leave Washington and go home to their own offices; but though the spur of war is no longer present, the need for their services is as great or greater than ever, and it is hoped that they will stick to the job until the danger period has passed. We may not agree with all they do, but we should coöperate to our utmost in bringing about the return of normal business.

A Flank Attack by Metric Advocates

Reconstruction is being used by the advocates of the metric system to again urge its adopcion by this country. This time the channel is the United States Section of the International High Commission. The recommendation reiterates the claims that the metric system is exclusively used throughout South America and that Great Britain is seriously considering its adoption. This completely ignores the report of the British Commission, which we printed on page 92a, Vol. 49, and which showed that the commission voted unanimously against it. It also ignored the result of the inquiry made by the American Institute of Weights and Measures, which showed that of the firms that trade regularly with South America and other so-called metric countries very few find that the use of the English weights and measures interfered in the least with trade.

This is a revival of the old fight to make the use of the metric system compulsory, as can be seen in the following:

> The United States Section of the International High Commission, having in view the present efforts to bring about the exclusive use of the metric system of weights and measures within the jurisdiction of the United States, resolves:
>
> I. That in the opinion of the section the adoption of that system would be productive of great advantage in the commercial relations of the United States with the other American republics.
>
> II. That the secretary of the section be directed to communicate a copy of this resolution to the chairman of the proper committees of the Senate and the House of Representatives.

This recommendation should be read carefully to convince oneself that it really means compulsion. Then get busy and prevent your congressman and senator from making your work of readjustment harder by foisting a new and unnecessary burden on you.

This is no time to urge changes of such a drastic and far-reaching nature. Our real problems at this time are human and not mechanical.

Reconstruction of Industry in Great Britain

As the United States learned a great deal in making munitions from the experience of Great Britain, all things considered it is not improbable that her experiences in promoting harmonious relations between the factors in industry will also be of benefit to this country now that production has again been turned into peaceful channels.

Eradication of the mutual distrust between employers and employed in English industries has been attempted by an association composed about equally of employers and trade unionists, known as the Devon and Cornwall Association for Industrial and Commercial Reconstruction. Conferences held at Plymouth resulted in a report which is outlined in the "Monthly Labor Review" of the United States Department of Labor, Bureau of Labor Statistics.

The conferees agreed that the root of the trouble in industry and commerce before the war was the distrust and suspicion between capital and management on the one hand and labor on the other, and that in spite of the unifying effect of the war the same situation might arise again when peace came. The aim, therefore, is to substitute for the old antagonism coöperation based on mutual understanding.

The causes of distrust are given as the dissociation of employees from any share in the control of industry or in the responsibility for the conditions under which it is carried on; the belief of each side that the other has obtained or is trying to obtain more than its share of the profits; the workers' fear of unemployment, and the objection of some employers to associations, whether of employers or employees.

To correct the first of these the English conferees held there must be a new outlook on life based on a frank recognition of the solidarity of society. It must be acknowledged that industry is made for man and not man for industry. For furthering the adoption of this principle the conferees propose an exchange of views, the award of greater returns of industry in proportion to workers, the securing of workers against the risk of unemployment and the abandonment by them of all restrictions on output. Both parties should organize, and collective bargaining should be extended.

The report recommends adoption of the proposals of the Whitley reports, which, in the opinion of the conferees, besides preventing or settling disputes, will, through the councils, supply facts on cost of production in a given industry, thus making possible a fair distribution of profits and preventing profiteering.

Foremen, it is urged, should be appointed by some method under which the employees shall have a voice in their selection. It is suggested either that the employer should name a panel from which the workmen should select the foreman, or that a foreman should not be appointed or continued in office in the face of reasoned opposition. Limitation of the right of arbitrary dismissal is strongly urged.

Pensions should not be allowed to count in the fixing of wages in the opinion of these conferees, and they strongly recommended that steps be taken to prevent the introduction of partly disabled soldiers as cheap labor.

Other suggestions of the conferences regarding demobilization problems are improvement and more extensive use of employment exchanges; change in trade-union customs only through joint arrangement between employers and employees; continued employment of women in industry in order to obtain increase of national production; analysis of wages into a basic or minimum wage, and a secondary or supplementary wage as a reward for acquired aptitude, extra effort, or natural physical or mental endowment; exclusion from industry of women with dependent children, who should receive adequate pensions, and the formation of a ministry of supply that should regulate the demand for governmental or municipal labor and thus make employment more secure.

Exhibits That Do Not Exhibit

BY ENTROPY

When a manufacturer of nails, files, grinding wheels or any other small stuff decides to advertise, his first impulse is to let everybody see his entire line. He knows all about the different sizes and styles of what he offers, and he is proud of the range. Naturally we like to show our friends the things that we enjoy seeing most, whether it is the new baby or a touring car, so Mr. Manufacturer puts a sample of everything in a showcase and sends out carloads of them. The man to whom he intrusts the job very naturally wants to make the job as attractive as possible, so he arranges the display in nice little geometric figures with little or no regard to which are right side up and which are not.

These showcases go out in the dusty world and soon become so coated that nothing shows except the name of the manufacturer. After all perhaps that is all that is necessary. An exhibit of nails means nothing to a prospective purchaser. Nails are not bought as ornaments; they are bought to use. What the customer wants to know, if he wants anything, is price, whether there is an undue percentage of club-footed nails present and whether the wire was straightened before the nails were cut and headed. Of course all the nails in the exhibit are perfect, but he knows perfectly well that those in the keg are not 100 per cent. so. Every manufacturer can put out identical exhibits; they can all pick out good nails. If the purchaser is an amateur there might be some advantage in marking the different sizes and kinds of nails with their trade names and weights, but most amateurs want a nail as long as their little finger or have a sample, and they would not notice the exhibit anyway.

The same is true of grinding wheels. The customer, nor hardly the maker, cannot tell one make of wheel from the other through a glass except by the label. The customer does not care anything about the wheels except what they will accomplish. An exhibit of elastic wheels might just as well be made by cutting out circles of emery cloth and sticking on the manufacturer's blotter. The customer still asks, "What will that wheel produce and how much more or less will it cost to produce it if I buy these wheels or those?" Why not exhibit results rather than implements? Why not show a lot of thin sections of tubing cut off with a single wheel and then show the number that an old-style emery wheel would cut off. Why not show a tube containing the amount of metal removed by a high-grade wheel against that removed by an emery wheel in a given time, or another showing the amount of abrasive worn off the wheel to get that production?

Take files. A printed catalog will show the different styles and sizes of files much more clearly than any arrangement of circles or stars or fans made up of files.

Here again an amateur woul like to know the trade names for the different shapes, cuts and sizes, but the large purchasers are interested in price and output and lasting qualities.

For all such exhibits would it not be better to make two kinds to meet the two needs—one for use in schools, which will show clearly and distinctly the trade names and designations for the things advertised, and the other for the professional purchasing public, which will exhibit what it wants to know—"what service will it render?"

Schools are always gunning for exhibits. Some manufacturers send one to every inquirer; some send very few if any. If the exhibit is educational it is a good investment, for a few years after graduation many of the pupils do get into responsible positions where they have an influence on purchases. Then they are apt to revert to the impressions made on them while in college or trade school, and suggest the maker whose name comes most easily to their lips. If the exhibit is not educational it would do more good to invest the same money in cigarettes or tickets to a burlesque show and present them with the compliments of the So-and-So Manufacturing Co. If the exhibit does mean something, if it helps the students by presenting to them some practical information which helps them out of a hole when they first get out in the world, then it also performs its advertising function. I recall an instance when an exhibit of screws showed the difference between a milled screw and a machine screw. The professor in charge had never heard of it, but one graduate was able to save his face by knowing. He never will forget the name of the makers of those screws.

Exhibits for store windows in the hardware district where the trade sought is the kind where the purchaser knows, or thinks he knows, everything but the lowest possible price, need something that will sharply call attention to a product's giving the best service and therefore justifying the slightly higher price necessarily asked. If a builder were sure that each keg of nails was 100 per cent. driveable, he would pay a few cents more than for a keg that was only 95 per cent. useful. An offer to replace every club-footed nail found in his kegs with two good ones might be worth more than all the exhibits he could put out, both in increased sales and more care in the shop, especially if it were possible to trace back to the packer and the machine.

It all comes down to a case of the publicity man looking through the other fellow's eyes. The things in which the manufacturer may take the most pride may not interest the customer at all

Personals

H. D. Runciman has been promoted from assistant to general manager of the Hoover Steel Ball Co., Ann Arbor, Mich.

George T. Fonda, who has been at the head of the Bureau of Labor and Safety at the Bethlehem Steel Corporation, Bethlehem, Penn., has resigned.

J. W. Brussel, formerly supervisor of machining at the Dayton Engineering and Laboratories Co., is now superintendent of the Wright-Martin Aircraft Corporation, Long Island City, N. Y.

E. L. Garrihan, who for 20 years was identified with the manufacturing and sales departments of the Bethlehem Steel Corporation, is now sales manager of the Tioga Steel and Iron Co., Philadelphia.

Earl L. Woods, sales manager of the tractor department of the J. I. Case Plow Co., Racine, Wis., was commissioned a captain in the Motor Transport Corps and reported for duty at Fort Sam Houston, Tex., on Nov. 10.

Judson T. Whitehead has been elected president of the Machinery and Metal Co., 42 Broadway, New York, succeeding George T. Baird. This appointment was brought about by the action of the War Trade Board.

Russell Gangewere has been elected president, **G. H. Blein** vice president and **Howard Hoegg** treasurer of the Weatherly Steel Co., Weatherly, Penn., following the acquisition of the Weatherly Iron and Steel Co. by the Weatherly Steel Co.

J. C. Fitzpatrick has quit as manager of the construction machinery department of Gaston, Williams & Wigmore, Inc., 39 Broadway, New York, to become assistant to the president of the American Condenser and Engineer Corporation, 120 Broadway, New York.

Albert Gough is at present in charge of the service department of the Liberty Motor Car Co., Detroit, Mich. Mr. Gough was at one time with the Shaw Electric Crane Co., Muskegon, Mich., in charge of production work, and more recently with the service organization of the Chalmers Company.

Harry Page of the bridge construction department of the Bethlehem Steel Co., Steelton, Penn., is chairman of the general committee, representing the employees under the new representative system of meeting with officials of the company, now in force at the Bethlehem plant. **Charles E. Bates** of the frog shop is the secretary.

Oswald Sewell has been appointed general manager of Wm. Jessop & Sons, Inc., 91 John St., New York. Mr. Sewell has been connected with Wm. Jessop & Sons, Ltd., Sheffield, England, since 1911 and for the past 2½ years was in London with the British Ministry of Munitions in charge of the section dealing with tool steel and alloy steel.

Prof. Comfort A. Adams, chairman of the committee on electric welding of the Emergency Fleet Corporation and president of the American Institute of Electrical Engineers, spoke on the application of electric welding to ship building at the meeting of the members of the Baltimore section of the Institute and the Engineers Club on Nov. 7.

John D. Galvin, a Lima, Ohio, manufacturer, is the new president of the Ohio Steel Foundry. He was elected to fill the vacancy caused by the death of **Harry Wright. J. W. Kaufman** of Columbus, Ohio, has been elected chairman of the board of directors, and **J. T. Kaufman** secretary and treasurer; **Frank Wright** is first vice president and general manager and **O. J. Smith** is second vice president.

Charles J. Brown was recently appointed assistant general superintendent of the Donora Works of the American Steel and Wire Co., Donora, Penn. Mr. Brown succeeds **C. M. Williams,** who resigned Oct. 1 to go to the Baldt Works of the Penn Seaboard Steel Corporation, New Castle, Del. Mr. Brown has been succeeded by **C. S. Forkum,** who was the assistant superintendent of the American Steel and Wire Co. at Cleveland, Ohio.

W. H. (Bill) Harman, president of the Southworth Foundry and Machine Co., Philadelphia, Penn., gave a smoker to the employees of the works at the Mercantile Club, Philadelphia, on Nov. 11. It was made a double occasion for jollity on account of the peace news. A number of presents were given to several officials. Superintendent Lapp received a loving cup; Fred Schrans, sales manager, received a specially designed time-saving device; G. Harry Case, the chief engineer, was also remembered. The steward of the shop was presented with a diamond scarf pin.

Business Items

R. Martens & Co., Inc., have removed their office from 24 State St., New York to larger quarters at 6-9 Hanover Street.

Klauder-Weldon Dyeing Machine Co., manufacturer of dyeing, bleaching and scouring machinery, has moved into its new general offices and plant at Jenkintown, Penn.

Obituary

Howard West, purchasing agent of factory supplies of Dodge Bros., Detroit, Mich., died at his home at Royal Oak, Nov. 2.

James W. Graham, president of the C. A. S. Products Co., Columbus, Ohio, manufacturer of auto gears, parts and accessories, died at his late residence recently. Mr. Graham was 29 years of age and reorganized the company from the old Foster Gear Co. about 3 years ago. His former home was Carthage, Canada.

Trade Catalogs

Colossus Cleaners. James H. Rhodes & Co., Chicago and New York. Booklet. Pp. 12; 5¼ x 7½ in. It contains several illustrations showing its use in machine-shop work, and is descriptive throughout.

High-Speed Twist Drills. National Device and Drill Co., Ypsilanti, Mich. Catalog. Pp. 16; 6 x 9 in. Illustrations, sizes and prices pertaining to "Ypsi" high-speed twist drills, both taper and straight shank, are given.

Clement Universal Lathe with Disappearing Bed. W. D. Clement, 169 High St., Waltham, Mass. Catalog. Pp. 20; 9 x 6 in. Many illustrations are given of various attachments, together with a description and prices.

Vul-Cot Fiber for Electrical, Mechanical, Automobile and Railroad Uses. American Vulcanized Fiber Co., Equitable Bldg., Wilmington, Del. Catalog. Pp. 16; 6 x 9 in. This is a special catalog and contains a number of illustrations descriptive of various parts for electrical, mechanical, automobile and railroad use.

Oxyacetylene Cutting and Welding. Victor Oxyacetylene Equipment Co., 884-886 Folsom St., San Francisco, Calif. Instruction Book. Pp. 37, 6 x 9¼ in.; illustrations, 40. The following is a partial list of the contents: Application of torch welding, qualifications of the operator, setting up the welding outfit, correct regulation of the oxyacetylene-welding flame, preparation for welding, preheating and reheating, filling rods and fluxes, executions of welds, iron and steel, high carbon and steel, special steels, cast-iron, aluminum, brass, copper and oxyacetylene cuttings.

Catalogs Wanted

The Holton Tractor Co., 136 West Maryland St., Indianapolis, Ind., desires to receive all kinds of catalogs of machine tools, etc.

New Publications

Mechanical and Electrical Cost Data—By Halbert P. Gillette and Richard T. Dana. One thousand seven hundred and thirty-four 4½ x 6¾-in. pages, handbook form, with a large number of tables, diagrams and illustrations; printed on thin paper and bound in soft red leather. Published by the McGraw-Hill Book Co., 239 West 39th St., New York. Price $6.

The main purpose of this book is to place in the hands of engineers in a convenient form for reference a large amount of practical information bearing upon economic and intensive-construction production and transportation in the mechanical and electrical fields. The general plan of the book has been to classify the material along the lines of work that one man is likely to be called upon to do at the same time, and this arrangement has been supplemented by a comprehensive index. The authors have borne in mind particularly the requirements of the designer, the appraiser, the chief of construction, the superintendent of operation and the engineering student.

The first thought that comes to one regarding a book on cost data is that it would be out of date before it could be got off the press on account of constantly changing conditions. The authors, however, have gone to considerable pains to show how cost data are usable even where wages and prices have changed since the compilation of the data. Where the methods used are the same as are in use today the age of cost data has nothing to do with their value provided the original rates of wages or other costs are given. Applying the present rates will then make the original cost data absolutely up to date.

The various chapter headings are: General Economic Principles; Depreciation, Repairs and Renewals; Buildings; Chimneys; Moving and Installing; Fuel and Coal Handling; Steam Power; Internal Combustion Engines and Gas Producers; Hydroelectric Plants; First Cost and Operating Expenses of Complete Electric Light and Power Plants; Overhead Electrical Transmission and Distribution; Underground Electrical Transmission and Distribution; Lighting and Wiring; Belts, Shafts and Motor Drives; Compressed Air; Gas Plants; Pumps and Pumping; Conveyors, Hoists, Cranes and Elevators; Heating, Cooking, Ventilating, Refrigerating and Ice Making; Electric Railways; Miscellaneous. Each chapter heading is supplemented by a large number of subheads which, together with the index, make the finding of subjects easy. The range of the book is enormous and the detail is such that seldom will a cost engineer be disappointed in not finding exactly what he wants.

Forthcoming Meetings

The American Society of Mechanical Engineers will hold its annual meeting in New York, Dec. 3-6. The secretary is Calvin W. Rice, 29 West 39th St., New York.

Boston Branch National Metal Trades Association. Monthly meeting on first Wednesday of each month. Young's Hotel. Donald H. C. Tullock, Jr., secretary. Room 41, 166 Devonshire St., Boston, Mass.

Engineers' Society of Western Pennsylvania. Monthly meeting, third Tuesday; section meeting, first Tuesday. Elmer K. Hiles, secretary, Oliver Building, Pittsburgh, Penn.

The National Machine Tool Builders' Association will hold its convention at the Hotel Astor on Tuesday and Wednesday, Dec. 10 and 11.

New England Foundrymen's Association. Regular meeting, second Wednesday of each month. Exchange Club, Boston, Mass. Fred F. Stockwell, 205 Broadway, Cambridgeport, Mass.

The New York State Industrial Safety Congress will hold its third annual session at the Hotel Onondaga, Syracuse, N. Y., Dec. 2-5. Particulars may be obtained from Louis Wiard, 230 Fifth Ave., New York.

Philadelphia Foundrymen's Association. Meeting first Wednesday of each month. Manufacturers' Club, Philadephia, Penn., Howard Evans, secretary, Pier 45, North Philadelphia, Penn.

Providence Engineering Society. Monthly meeting fourth Wednesday of each month. A. E. Thornley, corresponding secretary, P. O. Box 796. Providence, R. I.

Rochester Society of Technical Draftsmen. Monthly meeting, last Thursday. O. L. Angevine, Jr., secretary, 857 Genesee St., Rochester, N. Y.

The Southern Metal Plate Association will hold its semiannual meeting Dec. 3 in Charlotte, N. C. The secretary is W. E. Dunn, Candler Building, Atlanta, Ga.

Superintendents' and Foremen's Club of Cleveland. Monthly meeting, third Saturday. Philip Frankel, secretary, 310 New England Building, Cleveland, Ohio.

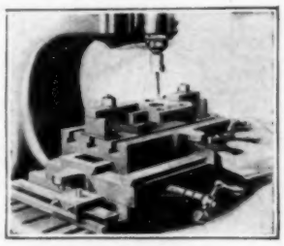
Technical League of America. Regular meeting, second Friday of each month. Oscar S. Teale, secretary, 240 Broadway, New York.

Western Society of Engineers, Chicago, Ill. Regular meetings, first, second, third and fourth Mondays of each month, except July and August. Edgar S. Nethercut, secretary, 1735 Monadnock Block, Chicago, Ill.

Condensed-Clipping Index of Equipment

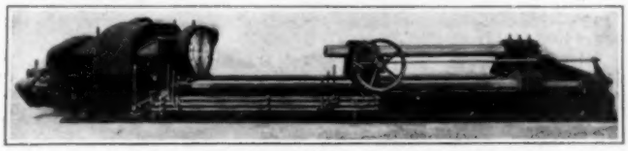
Clip, paste on 3 x 5-in. cards and file as desired

"Locator" for Precision Drilling
National Tool Engineering Co., Indianapolis, Ind.
"American Machinist," Nov. 14, 1918



Designed for drilling and boring holes in accurate relation to one another without the loss of the time ordinarily consumed in these operations by the button method. Consists of a double cross-slide combining base, saddle and table, both the table and saddle being fitted with ½-in. pins in the line of their travel. Directly below are slides also fitted with ½-in. pins, and when the table and saddle are moved and the movement measured across the pins with a micrometer or gage block the change of position can be easily adjusted to accurate limits.

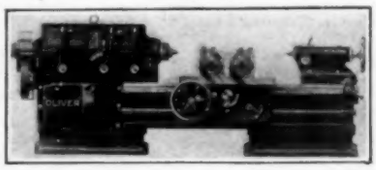
Lathe, Shell-Boring, No. 46 E
Amalgamated Machinery Corporation, 72 West Adams St., Chicago, Ill.



"American Machinist," Nov. 14, 1918

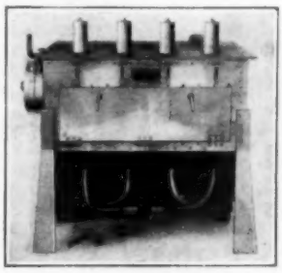
Designed particularly for boring work on shells from 12 to 20 in. in diameter. The spindle is of the all-geared type, being driven through two gears with teeth staggered to improve the driving quality. Floor space, 36 ft. 6 in. by 5 ft. 3 in.; height, 6 ft. 8 in.; main-drive pulley, 16-in. diameter, 12-in. face; pulley for rapid traverse and reverse, 16-in. diameter, 6-in. face; spindle speeds, four, with gear ratios of 27.3, 31.3, 36.1 and 42 to 1; feeds, four, 0.070 to 5 in. per spindle revolution; diameter of boring bar, 7⅛ in.

Lathe, 28-In., All-Geared, for Shell Work
Oliver Machinery Co., Grand Rapids, Mich.
"American Machinist," Nov. 21, 1918



The regular 28-in. engine lathe equipped with devices to make it of particular use in the production of shells. Is a heavy-duty machine with an all-geared head, and may be arranged for single-pulley drive from either a motor or a line shaft. All gears are of steel and all pinions are forgings. The spindle is forged from high-carbon steel and ground to size. The adjustable and replaceable bearings are of bronze. A double-wall type of apron is used.

Sandblast Cabinet, Type "EW"
Pangborn Corporation, Hagerstown, Md.
"American Machinist," Nov. 21, 1918



Consists principally of four rotating chucks driven at slow speed for rotating the shell while the blasting operation is in process. The chucks are mounted on ball bearings which are protected from dust and abrasive, the shells being held in a vertical position with the openings pointing downward. Four suction-type projectors are arranged below the shell openings. The bottom of the cabinet forms a hopper for the abrasive, and supplies this by gravity to the feed boxes located at the front and visible to the operator. A feature of the machine is that no catches or other devices are required to hold or rotate the shells other than the chucks themselves into which they are merely set.

Testing Machine, "C. E. Testall"
Charles Eisler, 36 Watsessing Ave., Bloomfield, N. J.
"American Machinist," Nov. 14, 1918

Designed to meet a variety of requirements for testing and determining center distances of gears of all types, and for general center testing on a single machine where the variety of products handled is great and a single-purpose machine is not desirable. The stand is at a convenient height to insure comfort in handling the work. The construction is such that it may also be used for a variety of other work, such as cams, cutters, gages, reamers, hobs, jigs, etc. The wearing parts are made of tool steel, hardened and ground; the bed is scraped to insure accuracy. Two sizes are made, the smaller weighing about 160 lb. and having a table 7½ x 17½ in., while the No. 2 will handle work approximately twice the size.

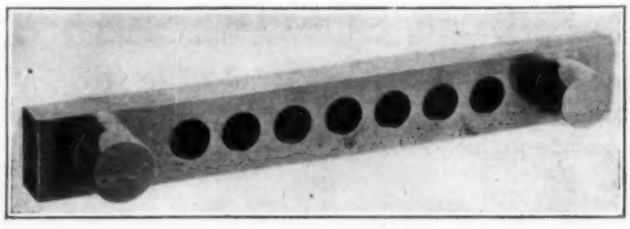
Lapping Machine for Cylindrical Work, No. 1
Beach Manufacturing Co., 80 Boylston St., Boston, Mass.
"American Machinist," Nov. 21, 1918

Designed for lapping plug and ring gages or other similar work up to 10 in. in diameter. The knee-operating feature gives instant control and leaves the operator's hands free to manipulate the work. Swing, 10 in.; diameter of spindle, 1⅛ in.; length of bronze-bushed spindle bearings, 2 in.; diameter of faceplate, 6 in.; driving cones, beveled steel and leather faced; bearings on spindle and driving cones, ball thrust.

Drill, Compressed-Air Corner, "Little Giant"
Chicago Pneumatic Tool Co., Fisher Bldg., Chicago, Ill.
"American Machinist," Nov. 21, 1918

Designed for use in corners or close quarters, the intermittent action of ratchet levers being eliminated, and a steady, uninterrupted revolution of the drill spindle being accomplished by a train of gears, thus retaining all the advantages of the ratchet type and permitting the drill to be used in the same narrow space, that is, within 1 7/16 in. of the end wall or corner. The drive from the motor to the spindle is through stub-tooth gears.

Sine Bar
M. & R. Tool Co., 59 Mechanic St., Newark, N. J.



"American Machinist," Nov. 21, 1918

This 3-in. sine bar is intended to be used with a perforated angle plate or other similar device, and seven holes are provided in order to attach the bar to the plate. The bar is lapped to size and guaranteed for accuracy.

Patented Aug. 20, 1918

WEEKLY PRICE GUIDE OF

IRON AND STEEL

PIG IRON—Quotations compiled by The Matthew Addy Co.:

	Current	One Month Ago
CINCINNATI		
No. 2 Southern	$37.60	$37.60
Northern Basic	34.80	34.80
Southern Ohio No. 2	35.80	35.80
NEW YORK, Tidewater delivery		
Penna. 2X	39.55	39.15
Virginia No. 2	41.70	41.70
Southern No. 2	41.70	41.70
BIRMINGHAM		
No. 2 Foundry	34.00	34.00
PHILADELPHIA		
Eastern Pa. 2X	39.15*	38.85*
Virginia No. 2	40.50†	40.50†
Basic	36.90*	36.60*
Grey Forge	36.90*	36.60*
Bessemer	39.10*	38.80*
CHICAGO		
No. 2 Foundry Local	34.50	34.50
No. 2 Foundry Southern	39.00	39.00
PITTSBURGH, including freight charge from the Valley		
No. 2 Foundry Valley	35.40	35.40
Basic	34.40	34.40
Bessemer	36.60	36.60

* F.o.b. furnace. † Delivered.

STEEL SHAPES—The following base prices per 100 lb. are for structural shapes 3 in. by ¼ in. and larger, and plates ¼ in. and heavier, from jobbers' warehouses at the cities named:

	New York			Cleveland		Chicago	
	Current	One Month Ago	One Year Ago	Current	One Year Ago	Current	One Year Ago
Structural shapes	$4.27	$4.245	$5.25	$4.17	$5.00	$4.27	$5.00
Soft steel bars	4.17	4.145	5.00	4.07	4.50	4.17	4.50
Soft steel bar shapes	4.17	4.145	5.00	4.17	4.50	4.17	4.50
Soft steel bands	4.77	4.995					
Plates, ¼ to 1 in. thick	4.52	4.495	10.00	4.42	7.00	4.25	9.00

BAR IRON—Prices per 100 lb. at the places named are as follows:

	Current	One Year Ago
Pittsburgh, mill	$3.50	$4.75
Warehouse, New York	4.75	4.75
Warehouse, Cleveland	4.67	4.95
Warehouse, Chicago	4.10	4.50

STEEL SHEETS—The following are the prices in cents per pound from jobbers' warehouse at the cities named:

	Pittsburgh, Mill, in Carloads	New York Current	New York One Month Ago	New York One Year Ago	Cleveland Current	Cleveland One Year Ago	Chicago Current	Chicago One Year Ago
*No. 28 black	5.00	6.52	6.495	6.445	6.42	5.75	6.52	6.445
*No. 26 black	4.90	6.42	6.395	6.405	6.32	5.65	6.42	6.405
*Nos. 22 and 24 black	4.85	6.37	6.345	6.295	6.27	5.60	6.37	6.295
Nos. 18 and 20 black	4.80	6.32	6.295	6.245	6.22	5.55	6.32	6.245
No. 16 blue annealed	4.45	5.72	5.695	5.645	5.62	5.20	5.72	5.645
No. 14 blue annealed	4.35	5.62	5.595	5.545	5.52	5.10	5.62	5.545
No. 10 blue annealed	4.25	5.52	5.495	5.445	5.42	5.00	5.52	5.445
*No. 28 galvanized	6.25	7.77	7.745	7.695	7.67	7.00	7.77	7.695
*No. 26 galvanized	5.95	7.47	7.445	7.395	7.37	6.70	7.32	7.395
No. 24 galvanized	5.80	7.32	7.295	7.245	7.22	6.55	7.47	7.245

* For painted corrugated sheets add 30c. per 100 lb. for 25 to 28 gage; 25c. for 19 to 24 gages; for galvanized corrugated sheets add 5c., all gages.

COLD DRAWN STEEL SHAFTING—From warehouse to consumers requiring at least 1000 lb. of a size (smaller quantities take the standard extras) the following discounts hold:

	Current	One Year Ago
New York	List plus 13%	List plus 25%
Cleveland	List plus 11%	List
Chicago	List plus 13%	List plus 10%

DRILL ROD—Discounts from list price are as follows at the places named:

	Extra	Standard
New York	35%	40%
Cleveland	35%	40%
Chicago	35%	40%

SWEDISH (NORWAY) IRON—The average price per 100 lb., in ton lots is:

	Current	One Year Ago
New York	$15.50–19	$14.00
Cleveland	20.00	15.00
Chicago	19.00	13.50

In coils an advance of 50c. usually is charged.
Note—Stock very scarce generally.

WELDING MATERIAL (SWEDISH)—Prices are as follows in cents per pound f.o.b. New York, in 100 lb. lots and over:

Welding Wire*		Cast-Iron Welding Rods	
½, ⅜, ¼, ⅛, 5/32, 3/16 in. No. 8, No. 10	22.10 to 33.00	⅜ by 12 in. long	16.00
No. 12		¼ by 19 in. long	14.00
No. 14 and ⅛ in. No. 18		⅜ by 19 in. long	12.00
No. 20		½ by 21 in. long	12.00
		* Special Welding Wire	
		⅛	33.00
		¼	30.00
		⅜	38.00

* Very scarce.

MISCELLANEOUS STEEL—The following quotations in cents per pound are from warehouse at the places named:

	New York Current	Cleveland Current	Chicago Current
Openhearth spring steel (heavy)	8.00	8.00	7.50
Spring steel (light)	10.00	11.25	11.75
Coppered bessemer rods	9.00	8.00	7.07
Hoop steel	4.77	4.75	4.77
Cold-rolled strip steel	8.02	8.25	8.57
Floor plates	6.27	6.00	6.25

PIPE—The following discounts are for carload lots f.o.b. Pittsburgh; basing card of Nov. 6, 1917, for steel pipe and for iron pipe:

BUTT WELD

Steel Inches	Black	Galvanized	Iron Inches	Black	Galvanized
⅛, ¼, and ⅜	44%	17½%	⅜ to 1½	33%	17%
½	48%	33½%			
¾ to 3	51%	37½%			

LAP WELD

2	44%	31½%	2	26%	12%
2½ to 6	47%	34½%	2½ to 4	28%	15%
			4½ to 6	28%	15%

BUTT WELD, EXTRA STRONG PLAIN ENDS

⅛, ¼ and ⅜	40%	22½%	½ to 1½	33%	18%
½	45%	32½%			
¾ to 1½	49%	36½%			

LAP WELD, EXTRA STRONG PLAIN ENDS

2	42%	30½%	2	27%	14%
2½ to 4	45%	33½%	2½ to 4	29%	17%
4½ to 6	44%	32½%	4½ to 6	28%	16%

Stock discounts in cities named are as follows:

	New York Black	New York Galvanized	Cleveland Black	Cleveland Galvanized	Chicago Black	Chicago Galvanized
⅛ to 3 in. steel butt welded	40%	28%	41%	26%	41.1%	26.1%
3½ to 3 in. steel lap welded	36%	25%	37%	23%	37.1%	23.1%

Malleable fittings. Class B and C, from New York stock sell at list + 15%. Cast iron, standard sizes, 5% off.

METALS

MISCELLANEOUS METALS—Present and past New York quotations in cents per pound, in carload lots:

	Current	One Month Ago	One Year Ago
Copper, electrolytic	26.50*	26.00	23.50
Tin in 5-ton lots	75.00	83.00	74.00
Lead	8.05	8.55	7.25
Spelter	8.45	9.50	7.88

* Government price.

ST. LOUIS

Lead	7.75	8.25	7.13
Spelter	8.10	9.25	7.63

At the places named, the following prices in cents per pound prevail, for 1 ton or more:

	New York Current	New York One Month Ago	New York One Year Ago	Cleveland Current	Cleveland One Year Ago	Chicago Current	Chicago One Year Ago
Copper sheets, base	38.00	38.00	35.00	38.00	36.00	36.00	35.00
Copper wire (carload lots)	35.00	35.00	38.50	35.00	32.00	33.00	33.00
Brass sheets	39.75	39.75	40.00	40.50	35.00	33.50	35.00
Brass pipe	46.00	46.00	43.00	42.50	42.00	44.00	42.00
Solder (half and half) (case lots)	55.00	58.00	39.25	50.50	40.00	56.00	38.00

Note:—Solder very scarce.

Copper sheets quoted above hot rolled 16 oz., cold rolled 14 oz. and heavier, add 1c.; polished takes 1c. per sq.ft. extra for 20-in. widths and under; over 20 in., 2c.

BRASS RODS—The following quotations are for large lots, mill. 100 lb. and over, warehouse; 25% to be added to mill prices for extras; 50% to be added to warehouse price for extras:

	Current	One Year Ago
Mill	$37.75	$29.00
New York	34.25	30.00
Cleveland	38.50	34.00
Chicago	29.50	37.00

SHOP MATERIALS AND SUPPLIES

ZINC SHEETS—The following prices in cents per pound prevail:

Carload lots f.o.b. mill 15.00

	In Casks		Broken Lots	
	Current	One Year Ago	Current	One Year Ago
Cleveland	18.75	20.00	18.40	20.50
New York	17.00	21.00	17.50	21.25
Chicago	22.00	21.00	21.50	21.50

ANTIMONY—Chinese and Japanese brands in cents per pound, in ton lots, for spot delivery, duty paid:

	Current	One Year Ago
New York	9.50–10.50	14.00
Chicago	15.50	16.25
Cleveland	14.50	16.00

OLD METALS—The following are the dealers' purchasing prices in cents per pound:

	New York		Cleveland		
	Current 1918	One Year Ago	Current 1918	One Year Ago	Chicago
Copper, heavy and crucible	23.00	22.00	23.00	21.00	21.50
Copper, heavy and wire	22.00	21.00	22.00	21.00	21.00
Copper, light and bottoms	18.50	19.00	19.00	20.00	21.00
Lead, heavy	7.00	4.75	7.00	5.50	6.20
Lead, tea	6.00	4.00	5.00	4.50	5.50
Brass, heavy	13.00	15.00	15.00	14.00	18.50
Brass, light	10.00	10.50	11.00	11.00	12.50
No. 1 yellow brass turnings	13.00	16.00	12.50	15.00	14.50
Zinc	5.75	5.75	5.50	5.50	5.80

ALUMINUM—The following prices are from warehouse at places named:

	New York	Cleveland	Chicago
No. 1 aluminum, guaranteed over 99% pure, in ingots for remelting (1-15 ton lots), per lb	33.20c.	32.30c.	33½c.

This is the Government price for lots of from 1 to 14 tons.

COPPER BARS from warehouse sell as follows in cents per pound, for ton lots and over:

	Current	One Year Ago
New York	32.00	40.00
Chicago	38.00	40.00
Cleveland	36.50	39.00

BABBITT METAL—Warehouse price per pound:

	New York		Cleveland		Chicago	
	Current	One Year Ago	Current	One Year Ago	Current	One Year Ago
Best grade	90.00	70.00	93.00	80.00	96.00	70.00
Commercial	45.00	40.00	23.00	21.00	25.00	25.00

SHOP SUPPLIES

NUTS—From warehouse at the places named, on fair-sized orders, the following amount is deducted from list:

	New York		Cleveland		Chicago	
	Current	One Year Ago	Current	One Year Ago	Current	One Year Ago
Hot pressed square	$0.80	List	$1.25	$1.30	$0.98	$2.00
Hot pressed hexagon	.80	List	1.05	1.30	.78	2.00
Cold punched hexagon	2.50*	List	.75	List	1.00	1.50
Cold punched square	2.50*	List	.75	List	1.00	1.50

* List plus.

Semi-finished nuts sell at the following discounts from list price:

	Current	One Year Ago
New York	50–10%	50%
Chicago	50%	45%
Cleveland	50–10%	50%

MACHINE BOLTS—Warehouse discounts in the following cities:

	New York	Cleveland	Chicago
½ by 4 in. and smaller	40–10%	40–10%	37%
Larger and longer up to ½ in. by 30 in.	20–5%	20– 5%	25–5%

WASHERS—From warehouses at the places named the following amount is deducted from list price:

For wrought-iron washers:

New York ..... $2.00 Cleveland ..... List Chicago $2.50

For cast-iron washers the base price per 100 lb. is as follows:

New York ..... $6.00 Cleveland ..... $4.25 Chicago $4.50

CARRIAGE BOLTS—From warehouses at the places named the following discounts from list are in effect:

	New York	Cleveland	Chicago
½ by 4 in. and smaller	40%	45%	32½%
Larger and longer up to 1 in. by 30 in.	20–5%	20–5%	20%

COPPER RIVETS AND BURS sell at the following rate from warehouse:

	Rivets		Burs	
	Current	One Year Ago	Current	One Year Ago
Cleveland	List plus 10%	List plus 10%	List plus 10%	List plus 10%
Chicago	List price	List price	List plus 20%	List price
New York	15% from list	List plus 10%	List plus 5%	10-2½% from list

RIVETS—The following quotations are allowed for fair-sized orders from warehouse:

	New York	Cleveland	Chicago
Steel ½ and smaller	40%	45—5%	40%
Tinned	30%	45—5%	40%

Boiler, ½, ⅝, 1 in. diameter by 2 in. to 5 in. sell as follows per 100 lb.:

New York ..$5.675 Cleveland ..$5.15 Chicago ..$5.67 Pittsburgh ..$4.65

Structural, same sizes:

New York ..$5.775 Cleveland ..$5.25 Chicago ..$5.77 Pittsburgh ..$4.75

MISCELLANEOUS

SEAMLESS DRAWN TUBING—The base price in cents per pound from warehouse in 100-lb. lots is as follows:

	New York	Cleveland	Chicago
Copper	52.00	40.00	45.00
Brass	49.00	38.00	42.00

For immediate stock shipment 3c. is usually added. The prices of course vary with the quantity purchased. For lots of less than 100 lb., but not less than 75 lb., the advance is 2c.; for lots of less than 75 lb., but not less than 50 lb., the advance is 5c. over base (100-lb. lots); for less than 50 lb. but not less than 25 lb., 10c. should be added to the base price; and for quantities of from 10 to 25 lb. the extra is 25c.; less than 10 lb., add 35c.

Double above extras will be charged for angles, channels and sheet-metal mouldings if ordered in above quantities. The above extras also apply to brass rod other than standard stock sizes—stock sizes being considered as ½ up to 2 in. inclusive in rounds, and ½ up to 1½ in. inclusive in square and hexagon—all varying by thirty-seconds up to 1 in. and by sixteenths over 1 in. On all shipments aggregating less than 100 lb. there is usually a boxing charge of $1.50.

TIN PLATES—Warehouse prices per box:

Coke tin plate, 14 x 20:

	Cleveland		Chicago	
	Current	One Yr. Ago	Current	One Yr. Ago
100 lb	$9.17½	$12.00	$10.60	$11.75
I. C. 107 lb	9.42½	12.17½	10.70	11.90

Terne plate, 20 x 28:

Base Weight	Net Weight	Coating				
100 lb.	200	3		18.95	18.95	19.10	17.90
I. C.	214	8		19.25	19.25	19.40	18.25
I. C.	270	8		21.75	21.75	21.40	20.35
I. C.	218	12		21.75	21.75	22.60	19.25
I. C.	221	15		22.50	22.50	22.10	19.50
I. C.	226	30		23.25	23.25	22.60	20.50
I. C.	231	25		24.50	24.50	23.10	21.30
I. C.	236	30		25.75	25.75	23.60	22.25
I. C.	241	35		26.75	26.75	25.10	23.25
I. C.	246	40		28.00	28.00	25.60	24.55

NOTE—New York prices furnished on application to dealers. Price varies according to whether the plates are wanted for work essential to the war or for nonessential work.

COTTON WASTE—The following prices are in cents per pound:

	New York		Cleveland	Chicago
	Current	One Year Ago		
White	11.00 to 13.00	13.00	16.50	12.00 to 16.50
Colored mixed	8.50 to 12.00	12.00	13.00	11.50 to 14.00

WIPING CLOTHS—Jobbers' price per 1000 is as follows:

	13½ x 13½	13½ x 20½
Cleveland	52.00	58.00
Chicago	48.00	50.00

SAL SODA sells as follows per 100 lb.:

	Current	One Month Ago	One Year Ago
New York	$1.75	$1.75	$1.75
Philadelphia	1.75	1.75	1.75
Cleveland	2.25	2.40	2.10
Chicago	2.00	2.00	2.00

ROLL SULPHUR in 360-lb. bbl. sells as follows per 100 lb.:

	Current	One Month Ago	One Year Ago
New York	$3.65	$4.30	$4.30
Cleveland	4.60	4.60	4.50
Chicago	4.50	4.00	3.80

COKE—The following are prices per net ton at ovens, Connellsville, and cover the past four weeks:

	Nov. 21	Nov. 14	Nov. 7	Oct. 31	Oct. 24
Prompt furnace	$6.00	$6.00	$6.00	$6.00	$6.00
Prompt foundry	7.00	7.00	7.00	7.00	7.00

FIRE CLAY—The following prices prevail:

		Current
Chicago	450-lb. bbl.	$2.50
Cleveland	375-lb. bag	2.50

LINSEED OIL—These prices are per gallon:

	New York		Cleveland		Chicago	
	Current	One Year Ago	Current	One Year Ago	Current	One Year Ago
Raw in barrels	$1.64	$1.20	$1.90	$1.25	$1.83	$1.18
5-gal. cans	1.89	1.30	2.00	1.40	2.03	1.28

WHITE AND RED LEAD in 500-lb. lots sells as follows in cents per pound:

	Red				White	
	Current		1 Year Ago		Current	1 Year Ago
	Dry	In Oil	Dry	In Oil	Dry and In Oil	Dry and In Oil
100-lb. keg	14.00	14.50	12.25	12.50	14.00	12.50
25 and 50-lb. kegs	14.25	14.75	12.50	12.75	14.25	12.25
12½-lb. keg	14.50	15.00	12.75	13.00	14.50	12.50
5-lb. cans	....	.....	14.25	14.00	16.00	14.50
1-lb. cans	....	.....	14.25	14.50	17.00	14.50

NEW *and* ENLARGED SHOPS

Consult the Buying Section when in need of machinery or supplies

WASHINGTON, D. C.

The Navy aims to give information regarding its purchases to all manufacturers known to be in a position to supply its demand. Owing to the need of prompt action in the cases of all machine tools hereinafter listed, the Navy cannot arrange to permit a postponement of the opening of bids if the manufacturers are able to secure bidding forms and submit their bids prior to date fixed for opening.

In case time does not permit this, it will be appreciated if any manufacturer not receiving information directly regarding these purchases will notify the Purchasing Division, Bureau of Supplies & Accounts, Navy Department, Washington, D. C., in order that the firm's name may be properly listed for all future purchases.

The Bureau of Supplies and Accounts, Navy Department, will soon receive bids for machine tools as follows:

Schedule No. 7094½—2 drilling machines, delivery Alexandria, Va.

Schedule No. 7095½—8 drilling machines, delivery Alexandria, Va.

Schedule No. 7100½—7 drilling machines, delivery Boston, Mass.

Schedule No. 7110½—1 boring and milling machine, delivery Brooklyn, N. Y.

Schedule No. 7111½—1 threading machine, delivery Washington, D. C.

Schedule No. 7113½—1 planer and jointer lathe, band saw and universal saw, delivery Brooklyn, N. Y.

Schedule No. 7118½—6 pneumatic grinders, delivery Boston, Mass.

Schedule No. 7147½—2 tapping machines, delivery Newport, R. I.

Schedule No. 7149½—1 engine ash hoist, delivery Philadelphia, Penn.

Schedule No. 7154½—Miscellaneous steel drills, delivery Washington, D. C.

Schedule No. 7157½—1 setting machine saw, delivery Washington, D. C.

Schedule No. 7168½—3 bench and portable drills, delivery Washington, D. C.

Schedule No. 7206½—1 sensitive drill, delivery Philadelphia, Penn.

Schedule No. 7210½—1 of each knife grinder, saw, upkeep material, boring machine, squaring shears, delivery Brunswick, Ga.

The Bureau of Supplies and Accounts, Navy Department, will receive bids for machines and machine tools as follows:

Nov. 29—Schedule No. 6980½—2 emery grinders, delivery Brooklyn, N. Y.

Schedule No. 6997½—2 emery grinders, delivery Brooklyn, N. Y.

Schedule No. 7012½—1 milling machine, delivery Alexandria, Va.

Schedule No. 7013½—Cut off saws, delivery Boston, Mass.

Dec. 2—Schedule No. 7131½—Double emery grinder, delivery Charleston, S. C.

Schedule No. 7162½—1 screw machine, delivery Washington, D. C.

Dec. 6—Schedule No. 7120½—402 shears, delivery Brooklyn, N. Y.

Schedule No. 7127½—1 dowel and rod machine, delivery Puget Sound (Bremerton P. O.), Wash.

METAL WORKING

NEW ENGLAND STATES

Conn., Bridgeport—The Heppenstall Forge Co., 95 Howard Ave., has awarded the contract for the erection of an addition to its forge and casting shop. Estimated cost, $25,000.

Conn., Derby—The General Ordnance Co., New London, plans to build a 1-story, 60 x 250 ft. addition to its machine shop here. F. L. Blake, Secy.

Conn., Hartford—The North & Judd Co., East Main St., is having plans prepared by M. Unkelbach, Arch., New Britain, for the erection of a 1-story, 60 x 144 ft. garage here.

Conn., New Britain—The Stanley Rule and Level Works, 111 Elm St., has awarded the contract for the erection of a 1-story, 60 x 140 ft. factory. Estimated cost, $25,000. Noted Oct. 31.

Conn., New London—The Bureau of Yards and Docks, Navy Dept., Wash., D. C., has awarded the contract for the erection of a foundry and sheet metal shop here. Estimated cost, $93,159. Noted Oct. 10.

Me., Waterville—The Maine Central R. R., St. John St. Portland, is building a 2-story, 14 x 60 ft. pattern shop here. B. T. Wheeler, Portland, Ch. Engr.

Mass., Fitchburg—The Fitchburg Grinding Machine Co., Winter St., is building a 2-story, 40 x 48 ft. addition to its factory.

Mass., Lowell—The U. S. Cartridge Co., Lawrence St., has awarded the contract for a 2-story, 75 x 150 ft addition to its factory.

Mass., Palmer—The Palmer Foundry and Machine Co., 27 Foundry St., is building a 1- and 2-story, 75 x 120 ft. addition to its factory.

Mass., Quincy—The Electric Boat Co. has awarded the contract for the erection of a 1-story, 88 x 137 ft. addition to its plant.

Mass., Shelburne Falls (Boston P. O.)—The H. H. Mayhew Co., manufacturer of small tools, plans to build an addition to its factory.

N. H., Portsmouth—The Bureau of Yards & Docks, Navy Dept., Wash., D. C., plans to build a machine shop addition here. Estimated cost, $135,000.

R. I., East Providence (Providence P. O.)—The Abrasive Machine Tool Co., Dexter Rd., is building a 40 x 50 ft. addition to its plant.

R. I., Providence—The Providence Steel and Iron Co., Kinsley Ave., is having plans prepared by E. B. Whipple, Engr., 17 Exchange St., for the erection of a 1-story, 100 x 102 ft. structural steel shop. Estimated cost, $25,000.

MIDDLE ATLANTIC STATES

D. C., Washington—The Autocar Co. is having plans prepared by H. W. Castor, Arch., St. Gerard Bldg., Philadelphia, Penn., for a 5-story, 70 x 120 ft. factory to be erected here on 13th and D St.

D. C., Washington—A. L. Flint, Purch. Agent for Panama Canal, Wash., is in the market for flexible center shaft grinder and parts, 5 flute type, stay bolt taps, etc.

Del., Wilmington—The American Car and Foundry Co., foot of East 8th St., is building a 1-story, 76 x 192 ft. machine shop. Estimated cost, $29,500. Noted Nov. 21.

Md., Baltimore—The Baltimore & Ohio R. R., B. & O. Bldg., has awarded the contract for a 1-story, 90 x 240 ft. repair shop to be erected on Gilmore St. Estimated cost, $175,000.

Md., Baltimore—Bartlett Hayward Co., Scott and McHenry St., will build a munitions plant at Turners Station, consisting of three 1-story buildings, 61 x 375 ft., 50 x 95 ft. and 26 x 125 ft. Estimated cost, $125,000.

Md., Baltimore—Fire recently damaged the foundry of the Greenmount Iron and Manufacturing Co., 883 Greenmount Ave.

Md., Fairfield—The Union Shipbuilding Co. is in the market for shipbuilding machinery and machine tools, etc. A. Muller, Purch. Agent. Noted Oct. 24.

Md., Indianhead—The Bureau of Yards & Docks, Navy Dept., Wash., D. C., plans to build various repair shops at its nitrate plant here. Estimated cost, $390,000.

N. J., Belleville—J. Hozack, Rutgers and Isaac St., plans to build a munition plant.

N. J., Bloomfield—The International Arms and Fuse Co. has awarded the contract for the erection of a 1-story, 20 x 92 ft. addition to its plant on Grove St. Noted Sept. 19.

N. J., Camden—The Camden Iron Works, Line and Ringgold St., plans to rebuild its 1-story, 70 x 200 ft. pattern shop, which was partially destroyed by fire. Noted Nov. 14.

N. J., Gloucester—The Pusey and Jones Shipbuilding Co., foot of Poplar St., Wilmington, Del., plans to build an addition to its plant here.

N. J., Jersey City—The Erie R. R. has had plans prepared for the erection of a tank shop at the Provost St. Yards. Estimated cost, $18,000.

N. J., Long Branch—Fire recently destroyed the machine shop of C. E. Morris, 554 Broadway. Loss about $4000.

N. J., Newark—The General Lead Batteries Co., 4 Lister Ave., has leased a 1-story building on Central Ave. and Lock St., and will equip same for its own use.

N. J., Newark—The Newark Brush Scraper Co. has awarded the contract for the erection of a new addition to its plant.

N. J., Perth Amboy—The Hydraulic Concrete Stone Machinery Co., West Paterson, plans to build a new plant here.

N. J., Weehawken—Fire recently destroyed the plant of the Independent Lamp & Wire Co., Inc., Gregory Ave. Loss, $75,000.

N. Y., Baldwin—The Ordnance Engineering Co., 120 Broadway, New York City, has awarded the contract for the erection of a 60 x 100 ft. addition to its plant here. Estimated cost, $26,000.

N. Y., Buffalo—The Atlas Steel Castings Co., 1963 Elmwood Ave., has had plans prepared by Lackawanna Bridge Co., Arch., Abby St., for the erection of a 1-story, 50 x 112 ft. addition to its plant. Estimated cost, $8000.